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EDAPTS Test Deployment : System Installation and Technical Review Report

Xudong Jia, Ryan Beasley, Jeff Gerfen, Neil Hockaday, Bruce Chapman

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Smart Transit System

Task Order 6403

Cal Poly Pomona

EDAPTS Test Deployment

System Installation and Technical Review Report

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Prepared by

Xudong Jia, Ph.D., P.E
Ryan Beasley
California State Polytechnic University, Pomona

Jeff Gerfen
Neil Hockaday
California Polytechnic State University, San Luis Obispo

And

Bruce Chapman
California Department of Transportation

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Abstract

The California Department of Transportation (Caltrans) and the Federal Transit Administration (FTA) embarked on a research program entitled “Efficient Deployment of Advanced Public Transportation Systems” (EDAPTS) in the late 1990’s. The Bronco Express EDAPTS Stage 5 Deployment Demonstration project at California State Polytechnic University, Pomona (Cal Poly Pomona) is an integral part of this program. Its objective is to go through the procurement and deployment process of a low cost Intelligent Transportation Systems (ITS) solution to determine if the EDAPTS concepts are optimized for small transit agencies and if they can be successfully transitioned to the commercial marketplace.

This report documents the installation, verification, and validation steps associated with the Bronco Express EDAPTS Demonstration project. It identifies and summarizes procedures that are effective in installing and testing a lower-cost ITS system and provides a practical methodology for verifying and validating small transit ITS systems. It also documents outcomes of the installed system in compliance with the user needs and the performance specifications as requested in the Bronco Express EDAPTS RFP.

Keywords: EDAPTS, System Engineering, System Verification, System Validation, Intelligent Transportation Systems

Executive Summary

The California Department of Transportation (Caltrans) and the Federal Transit Administration (FTA) embarked on a research program entitled "Efficient Deployment of Advanced Public Transportation Systems" (EDAPTS) in the late 1990's. The Bronco Express EDAPTS Stage 5 Deployment Demonstration project at California State Polytechnic University, Pomona (Cal Poly Pomona) is an integral part of this program. Its objective is to go through the procurement and deployment process of a low cost Intelligent Transportation Systems (ITS) solution to determine if the EDAPTS concepts are optimized for small transit agencies and if they can be successfully transitioned to the commercial marketplace.

This report documents the installation, verification, and validation steps associated with the Bronco Express EDAPTS Demonstration project. It identifies and summarizes procedures that are effective in installing and testing a lower-cost ITS system and provides a practical methodology for verifying and validating small transit ITS systems. It also documents outcomes of the installed system in compliance with the user needs and the performance specifications as requested in the Bronco Express EDAPTS Request for Proposal (RFP).

The installation, system verification and validation processes for the Bronco Express EDAPTS System demonstrated a number of critical system deployment activities in using a modified version of the Federal Highway Administration (FHWA) Systems Engineering "V-model" (see Figure E-1). The selected system supplier was not required (nor paid) to complete the detailed design, software and hardware development, and unit/device testing steps called for by this approach, but rather delivered Commercial Off-the-Shelf (COTS) software and hardware products.

The system supplier acted as a system integrator to integrate all the COTS products for the Bronco Express EDAPTS system. Using the Bronco Express Operations Guidelines (or the "Concept of Operations"), high-level design documents and system requirements as guidelines, the system supplier, in coordination with the research team and Cal Poly Pomona Parking and Transportation Services (PTS), procured and installed the EDAPTS system. The procurement and installation process consisted of (1) web service establishment, (2) vehicle on-board subsystem installation and integration, (3) solar-powered roadside information display sign installation and integration, and (4) system testing.

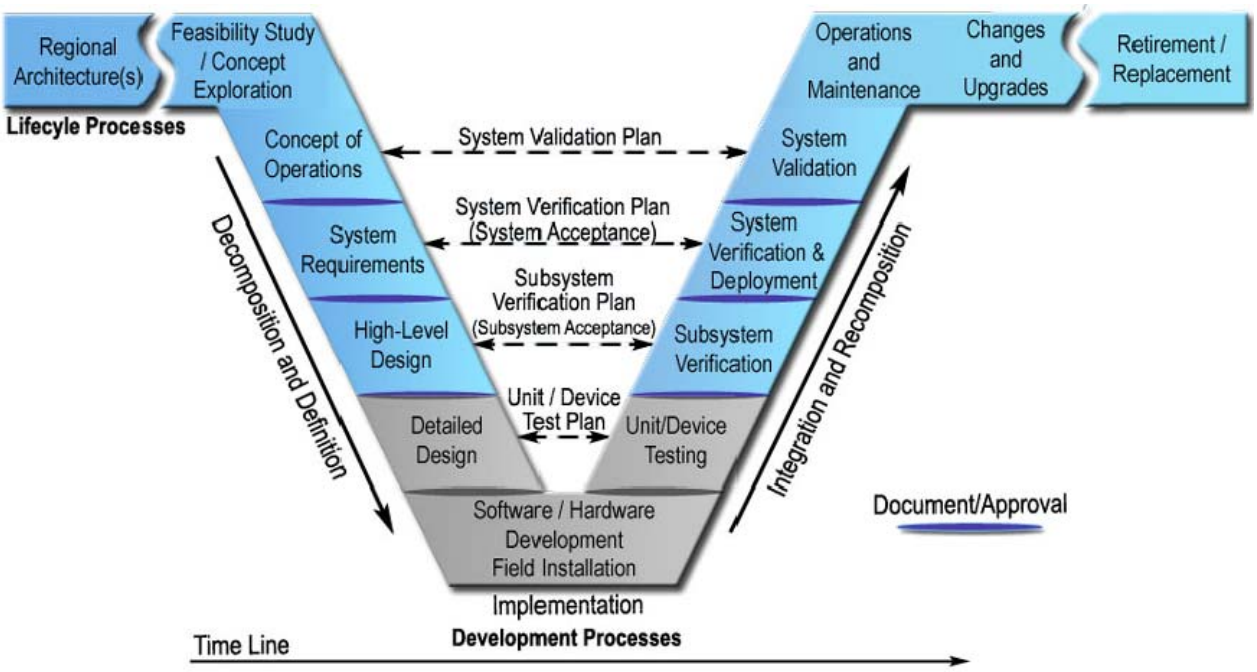

Figure E-1 Modified FHWA Systems Engineering V Model

(Source: Systems Engineering for Intelligent Transportation Systems, US DOT, 2007)

Please note that items in blue were completed as part of the procurement, system verification, and validation processes while the items in gray were not.

Since no solar-powered roadside information display signs meeting the Bronco Express EDAPTS system requirements and specifications were commercially available at the time of contract award, the system supplier could not install the signs at the same time as the AVL, APC, and MDT subsystems were installed. The supplier had to design, build, test, and deliver its own solar-powered sign product to Bronco Express separately from the rest of the installation and integration process. Cal Poly Pomona facilities personnel then installed the signs at the designated sites around campus.

The research team, observing the Bronco Express EDAPTS System installation process and working with the system supplier, developed the system verification plan, the validation plan and their associated test procedures. Using these test plans and procedures, the research team verified the installed subsystems and functionality against those required in the RFP, those provided in the system supplier's proposal, and those described in the Bronco Express EDAPTS Operations Guidelines.

The system verification process demonstrated the following findings:

a.) The installed EDAPTS system largely met all performance specifications, although it felled short in some key areas. Generally, these failures were in areas originally specified by the EDAPTS RFP, but were not promised by the system supplier.

b.) The system as a whole met the capacity and support requirements set out in the specification, supporting far larger quantities of elements such as vehicles, drivers, stops, and routes than those set forth in the EDAPTS RFP.

c.) The system met all applicable state and Federal standards, including Department of Transportation (DOT) requirements for vehicle onboard components and Federal Communications Commission (FCC) licensing requirements for wireless data communications devices.

d.) One of the primary deficiencies was the lack of schedule adherence capability throughout the system, as it had no concept of fixed-route scheduling. It also did not conform to the EDAPTS Data-Formatting Standard at any level of the system, detracting from the open-format ideal of EDAPTS and complicating the possibility of part-interchangeability and the modification or addition of new features in the future by the university or another system supplier.

The system validation process demonstrated the following findings:

1) The installed system met the user needs and operational requirements described in sixteen of twenty seven operational scenarios.

2) The installed system failed ten operational scenarios. The majority of the failures were in scenarios related to functionality of the MDT devices. For example, the MDT (1) did not display the stop where the driver would begin the route, (2) did not start displaying the time in a large digital format once the driver started driving and (3) did not display the current arriving at a stop.

3) One of the twenty seven scenarios was not tested due to the fact that the Bronco Express EDAPTS system provided a service that substituted the service described in the testing scenario.

The system verification and validation demonstrated in this project proved to be very effective in determining how well the installed EDAPTS system met the system functional requirements and the operational characteristics and user needs described in the EDAPTS RFP. The processes and test procedures developed by the team ensured that the verification and validation tests are repeatable and well documented.

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1. INTRODUCTION

The Bronco Express Efficient Deployment of Advanced Public Transportation Systems (EDAPTS) Demonstration project at California State Polytechnic University, Pomona (Cal Poly Pomona) is currently seeking to determine if the EDAPTS concepts for procuring low cost Intelligent Transportation Systems (ITS) are optimized for small transit agencies and if they can be successfully transitioned to the commercial marketplace. This research project, hereafter referred to as the "Bronco Express EDAPTS Demonstration", is sponsored by Caltrans and the Federal Transit Administration (FTA) and seeks to update to current practice the original EDAPTS research done by California Polytechnic State University, San Luis Obispo (Cal Poly San Luis Obispo). This report documents the procurement, installation, verification, and validation steps associated with the Bronco Express EDAPTS Stage 5 Deployment Demonstration.

This report identifies and summarizes procedures that are effective in installing and testing a lower-cost ITS system and provides a practical methodology for verifying and validating small transit ITS systems. It is the second of three reports documenting the Bronco Express EDAPTS Demonstration. The first report, entitled "Cal Poly Pomona EDAPTS Test Deployment Procurement Documentation Package" (Jia and Gerfen, 2008), outlined the procurement of the Bronco Express EDAPTS system. The next and final report in this sequence will collect and summarize all previous reports in this project and provide insights, recommendations and lessons learned during the Bronco Express EDAPTS Demonstration.

2. EDAPTS RESEARCH PROGRAM OVERVIEW

The EDAPTS research approach promotes innovative communications approaches, open source designs, solar powered real-time arrival signs, and innovative data links to help small transit provider access useful ITS solutions. It also promotes the acquisition of commercial off-the-shelf (COTS) equipment/software. The approach focuses on providing improved transit services and safety for passengers, decreasing driver work load and providing improved operations data to management; and doing this at a cost level that small transit properties can afford. The EDAPTS research goal is to demonstrate the viability of lower-cost implementations of transit ITS technologies; where the concepts, designs and performance expectations are tightly focused and tailored specifically to small transit system needs.

The Bronco Express EDAPTS Demonstration is built upon the results of prior research efforts. Additional research, outside this demonstration effort, looked at the cost benefit of the EDAPTS approach in day-to-day operations and developed performance specifications specifically focused on small transit procurement of EDAPTS compliant solutions (Jia et al, 2007; Gerfen et al, 2007).

3. PROJECT METHODOLOGY

Cal Poly Pomona and Cal Poly San Luis Obispo researchers solicited participation from Bronco Express stakeholders who would be affected or would benefit from the deployment of an EDAPTS ITS system at Cal Poly Pomona. These representatives formed the Bronco Express EDAPTS Advisory Panel and it had representation from the university, transit provider, transit operator, security, campus parking, drivers and student body.

Using the Advisory Panel as an active resource, the research team developed a clear understanding of the needs, the problems, and the envisioned solutions. This was documented in the Bronco Express EDAPTS Operations Guidelines (Jia and Gerfen, 2007) and formed the basis for the Bronco Express procurement effort. To mimic a typical small transit agency procurement process, procurement was done using a Request for Proposal (RFP) process through the Cal Poly Pomona's Procurement Office.

The RFP was released, advertised, and awarded to the system supplier with the best value bid, where cost was a significant factor in bid evaluation. The selected solution included automatic vehicle location (AVL), automatic passenger counters (APC), solar-powered roadside information display (RID) signs at four bus stops and mobile data terminals (MDTs) on all Bronco Express Buses.

Following installation and system testing by the vendor, the research team completed the final subsystem verification, system verification, and system validation steps to determine how close the installed system came to meeting desired RFP functionality and specifications.

This project utilizes a modified version of the Federal Highway Administration (FHWA) Systems Engineering "V-model" (see Figure 1 below) as a guide to facilitate a systematic and efficient procurement process.

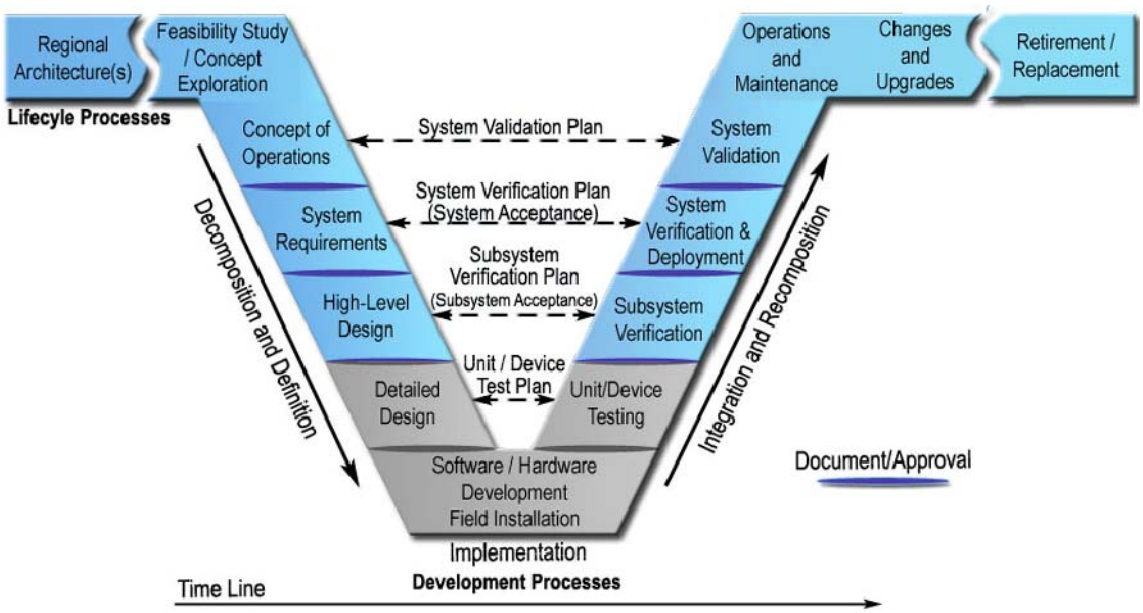

Figure 1 Modified FHWA Systems Engineering V Model
(Source: Systems Engineering for Intelligent Transportation Systems, US DOT, 2007)

Please note that items in blue were completed as part of the procurement, system verification, and validation processes while the items in gray were not.

The V-model is modified in that the selected system supplier was not required (nor paid) to complete the detailed design, software and hardware development, and unit/device testing steps called for by this approach, but rather delivered Commercial Off-the-Shelf (COTS) software and hardware products. Aspects of the V-model, which this deployment project adhered to, included development of the Bronco Express Operations Guidelines (i.e. "Concept of Operations"), definition of high-level design documents and development of system requirements. These documents were then used as source material to help define and conduct system verification and validation for the Bronco Express EDAPTS System.

The procurement process for the Bronco Express EDAPTS System demonstrated a number of critical system procurement activities in using the modified V-model as a framework. These activities included active participation of the stakeholders throughout the process, identification of the highest priority systems and subsystems in the high-level design step, selection of relevant performance specifications for the desired system and subsystems, and selection of a qualified system supplier for the integration and installation of the system.

Once the RFP system supplier selection phase was completed, the Bronco Express EDAPTS Demonstration moved into its installation stage. The winning system supplier, in coordination with the research team and Cal Poly Pomona Parking and Transportation Services (PTS), installed the first elements of the Bronco Express EDAPTS System, the on-board equipment, on April 29, 2008. On January 8, 2009 the final elements of the system, the solar-powered dynamic roadside information display signs, were installed. The system then entered the acceptance verification and validation phase of the research demonstration.

By observing the Bronco Express EDAPTS System installation process and working with system supplier, the research team developed an understanding of the operational functions and features of the installed system. This understanding was used to develop the system verification plan, the validation plan and their associated test procedures. The purpose of these test plans and procedures was to verify the installed subsystems and functionality against the requirements of the RFP and the system supplier's proposal. The plans and test procedures also validate the user needs and performance measures against the Bronco Express EDAPTS Operations Guidelines. A detailed description of the Bronco Express EDAPTS System installation, verification and validation processes is provided in later sections.

4. BRONCO EXPRESS EDAPTS SYSTEM INSTALLATION

This Section covers the four phases of the Installation and Test period: (1) Web Service Establishment, (2) Vehicle On-Board Subsystem Installation and Integration, (3) Solar-Powered Roadside Information Display Installation and Integration, and (4) System Testing.

The Bronco Express EDAPTS System installation was done by both system supplier and Cal Poly Pomona personnel. These groups installed all the subsystems, components and software functions provided in the system supplier's proposal. During this process, the system supplier identified, acquired and tested the required COTS hardware and software components before the components were integrated into the Bronco Express EDAPTS System.

Since no solar-powered roadside information display signs meeting the Bronco Express EDAPTS system requirements and specifications were commercially available at the time of contract award, the system supplier could not install the signs at the same time as the AVL, APC, and MDT subsystems were installed. The supplier had to design, build, test, and deliver its own solar-powered sign product to Bronco Express separately from the rest of the installation and integration process. Cal Poly Pomona facilities personnel then installed the signs at the designated sites around campus.

4.1 Web Service Establishment

The Bronco Express EDAPTS System installation effort provided a unique opportunity to evaluate the integration of small transit ITS solutions under the ITS Services Business Model. Before the Bronco Express EDAPTS System was installed, the successful system supplier had already supplied similar web-based transit services on a monthly-fee basis to its existing clients. These services included the use of AVL technologies, wireless data communications technologies, data base management systems, and dedicated web services that showed real time locations of buses, predicted bus arrival times, and provided specialized bus operational information. This real-time tracking technology reported bus locations to a Web-based server with a delay of not more than 10 seconds, and bus locations and related operational data (speed, heading, door status, ignition state, and boarding and alighting passengers) were stored in databases and used to predict the arrival of buses at each stop for each service route. Predicted bus arrival times and other statistical summaries of bus operations were provided to customers through web portals.

The system supplier provides the Bronco Express EDAPTS System service with two web portals. One, http://www.broncoshuttle.com, enables the public to access bus location and status. The other is a private website and allows the EDAPTS research team and PTS to manage the Bronco Express EDAPTS System remotely. This web site is password-protected, allowing only authorized individuals to access the site and manage the Bronco Express EDAPTS System.

4.2 Vehicle On-Board Subsystem Installation and Integration

The vehicle on-board subsystem consists of the AVL, APC, and MDT components.

AVL Procurement and Installation

Eight AVL units, each consisting of a Global Positioning Satellite (GPS) receiver system and a data modem, were procured as COTS products for the Bronco Express EDAPTS System. Each AVL unit was configured to interface with other in-vehicle components including the APC and MDT units. The AVL units use Global System for Mobile (GSM) communications links and General Packet Radio Service (GPRS) technologies to provide mobile data communication services for the Bronco Express EDAPTS System.

The system supplier installed the first AVL unit on a Cal Poly Pomona bus on April 29, 2008. During the installation, the supplier placed the unit on the backside of the driver seat, out of the way of daily operations. Figure 2 shows a typical installation of the AVL unit on a Bronco Express bus.

Figure 2 AVL Unit Installed on Bronco Express Shuttle Bus

After the first AVL unit was mechanically and electrically mounted in the bus, the system supplier configured the device to communicate with the rest of the system. The AVL unit functioned properly, detecting the location of the bus and transmitting the location information to the remote Web server. The system supplier, working with the PTS driver, tested the unit and the system by verifying the following functional requirements.

1) The unit reported geographic position to the server and back through each of the two web portals within one minute of vehicle start.
2) The unit reported position every 6 seconds at low speeds and every 10-15 seconds at medium and high speeds.
3) The unit acknowledged operation to the server once per minute when it is turned on.
- The unit reported door open and door close events to the server reliably.
4) The unit automatically assigned itself to the route it is currently serving.
5) The system accurately predicted bus arrival time at bus stops.

The system supplier started installing the remaining AVL units on the remaining seven buses after PTS operated the first AVL equipped bus for several days and verified the unit functioned as indicated by the supplier. The installation required approximately two weeks to complete and was planned to not interfere with Bronco Express operation.

APC Procurement and Installation

The supplier, working with PTS and the research team, selected infrared-based APCs over mechanical pressure APCs for the Bronco Express EDAPTS System. These APCs are specifically designed for transit use to collect passenger boarding and alighting counts. They then pass the counts on to the AVL unit for transmission back to the server. The door sensors are overhead-mounted, directionally sensitive, two-beam systems that are only activated when a hard-wired "door open" signal is active.

PTS and the supplier determined the door configurations and measured dimensions of all the buses to determine the number of APCs and their configuration required for the Bronco Express EDAPTS System. This indicated that a single one-door APC device and seven two-door APC devices were needed for coverage of the eight buses.

The supplier procured the necessary APC devices and installed them six weeks after the AVL units were successfully installed. Initially, AVL units and APC devices were to be installed at the same time in order to save overall installation time; however, the procurement delay time for APC devices was longer than that for AVL units and the installations had to be completed separately. The APC installation was completed over a four-day period, beginning on June 23, 2008. Figure 3 shows a typical APC installation on a Bronco Express shuttle bus.

Following APC installation, the supplier conducted a set of tests on each bus to verify proper APC operation. Supplier personnel, working with PTS drivers, tested the device and the EDAPTS system by verifying the following functional requirements.

- Door open and close events were reliably reported.
- People boarding the bus, including those entering quickly or those entering in close proximity were counted accurately.
- People exiting the bus, including those that exit quickly or left in close proximity to each other were accurately counted.
- Proper communication between the APC and the AVL unit was established and maintained.

Figure 3 Automatic Passenger Counter Installed on Bronco Express Shuttle Bus

MDT Procurement, Unit Testing, and Installation

The system supplier worked with PTS to select an appropriate MDT device from the available COTS products based on the indicated functionality contained in the Bronco Express EDAPTS Operations Guidelines. This selection considered factors such as cost, ruggedness and reliability. The procured MDT devices have a bright Thin Film Transistor (TFT) graphic Liquid Crystal Display (LCD) and use the Windows® CE operating system.

Due to mechanical mounting challenges, the system supplier used various MDT mounting schemes to properly position the MDT devices on buses. All MDT installations were completed by October 17, 2008. The installed MDTs were placed within the reach of drivers, but not in the way of driver normal activities. Figure 4 shows a typical installation of the Mobile Data Terminal on a Bronco Express shuttle bus.

Figure 4 Mobile Data Terminal Installed on Bronco Express Shuttle Bus

4.3 Solar-Powered Roadside Information Display Installation and Integration

The roadside information displays present "live" data to waiting passengers at specific stops by showing the estimated arrival time of all buses serving that particular stop. While these signs typically display arrival time information, they may also display other messages such as public service announcements or system status information.

The Roadside Information Display subsystem used for the Bronco Express EDAPTS System consists of a display, a mounting post, and a post foundation. The post supports the sign and must provide a safe, secure mounting under local environmental conditions, including wind and earthquake events. The foundation is poured concrete with an appropriate mounting receptacle to which the post is secured.

– Solar-Powered Sign

To respond to the Cal Poly Pomona's green initiative, Bronco Express requested solar-powered signs in the RFP. However, commercially produced solar-powered signs that met the Bronco Express EDAPTS system requirements and specifications, and also met the Americans with Disabilities Act (ADA) guidelines and requirements, were not commercially available at the time of the procurement. The system supplier decided to work with PTS and the research team to develop and design a solar-powered sign for installation at Cal Poly Pomona.

The system supplier reviewed the roadside information display performance requirements in the Bronco Express EDAPTS RFP and presented the prototype to the research team and the Advisory Panel members on June 24, 2008. Since the prototype did not fully consider the ADA guidelines and requirements, the panel rejected it and asked the supplier to provide a new ADA compliant prototype design for evaluation.

The system supplier continued working with the research team and Advisory Panel to establish a better understanding of the performance requirements that needed to be met in the new sign

prototype. The new design considered the input of several team discussions, reviews of ADA guidelines, and the requirements described in the RFP, Section 508[1]. This design used information contained in the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) (http://www.access-board.gov/adaag/). The understanding developed during this design process helped the supplier in its solar-powered sign prototype design effort.

The supplier presented its new solar-powered sign prototype to the research team and Advisory Panel members on December 4, 2008. The prototype sign was temporarily integrated into the Bronco Express EDAPTS system and tested with respect to the functionality described in the RFP. The research team and the Advisory Panel members accepted the prototype sign design and asked the system supplier to manufacture four production-quality signs for the Bronco Express EDAPTS System. Final versions of the solar-powered sign were delivered to Cal Poly Pomona on December 28, 2008 for installation at the sites identified in the RFP. The final product operates over cellular networks, accommodates both sight-challenged and hearing-challenged passengers, and has the following features:

- Entirely solar-powered, making connection to a commercial line AC source unnecessary.
- Mounts on a 6-inch steel pole, approximately 8 feet above ground.
- Uses a solar panel typically mounted on top of the pole, which is typically out of reach to vandals.
- Has an estimated 6-7 day run time with no sunlight on solar panels
- ADA compliant, using 3-inch characters in the “one-line” mode or 2-inch characters in the “two-line” mode.
- ADA compliant, using a text-to-speech engine in the sign to announce expected bus arrival times when passengers press the pole-mounted button.

– Sign Post and Foundation

[1] Section 508 refers to Section 508 of the Rehabilitation Act. In 1998, Congress amended the Rehabilitation Act to require Federal agencies to make their electronic and information technology accessible to people with disabilities.

Section 508 was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under Section 508 (29 U.S.C. § 794d), Federal agencies must give disabled employees and members of the public access to information that is comparable to the access available to others.

Meeting Section 508 requirements is also the policy of the California State University to make information technology resources and services accessible to all CSU students, faculty, staff and the general public regardless of disability.

Once the sign design was accepted by the research team and the Advisory Panel members, the Cal Poly Pomona Facilities Department personnel worked with the system supplier to establish structural and dimensional specifications for sign posts and foundations. Procedures were also developed for installing the signs on campus property.

The Facilities Department personnel, along with the research team and PTS, conducted an investigation of the four designated sites and evaluated the sites from the view of passenger demand, solar coverage, utilities, ADA accessibility, soil conditions, and adjacent surroundings of the bus stops at the sites. After the investigation, the Facilities personnel identified the following site design criteria:

- Solar energy from a sign mounted solar panel could not be utilized at the Building 94 bus stop site due to large trees in the stop area. The sign's solar panel needed to be moved to the roof of an adjacent building. A 50-ft cable run was needed to allow running a low voltage wire bundle to connect the remotely located solar panel to the sign at the bus stop site.
- Sidewalks at two sites (Building 94 and CLA Building) had to be reconstructed in order to install the solar-powered signs. The new sidewalks had to be ADA compliant.
- Concrete pads were needed at the sites of University Village and Parking Lot B. The new pads provided an area for people to stand while waiting for buses.
- All sign posts had to be painted to meet the University color standards.
- All sign posts had to be high enough to provide a vertical clearance of 8 ft above the ground for signs.
- All sign posts required a solid concrete foundation to securely hold the pole and sustain the sign weight (approximately 200 pounds) during environment stress conditions.

– Sign Installation

After establishment and definition of the sign post design criteria, the Cal Poly Pomona Facilities Department did the detailed structural design of signposts and developed a sign installation plan for the four solar-powered signs. Facilities Department personnel started the actual installation of signs on December 27, 2008 and completed the installation on January 7, 2009. Figures 5 and 6 show the signs installed at the Building 94 and the University Village sites.

Appendix A provides the detailed structural design of sign posts and the site layout design of sign foundations.

4.4 System Testing

After completion of sign installation, the system supplier did a one-day on-site system test. The supplier, working with PTS personnel, checked the communications and data flows from APCs, MDTs, and AVLs to the supplier's Data Center where the system software and databases reside. They also verified the web services provided by the two web portals and inspected the

messages displayed on the solar-powered signs. Through this system test, the supplier ensured that the installed system performed to meet the requirements described in its proposal. The "real-time" bus arrival information displayed on the four solar signs was verified to match the time estimates provided by the system software. Figure 7 shows system supplier personnel checking the wireless connection from the sign to the EDAPTS system server.

Since this on-site system test was a manufacturers' bid compliance test, it did not verify if the installed system had fully met all the functions originally described in the EDAPTS RFP. Also it did not validate if the installed system met the total operational requirements envisioned by the University. To accomplish this, a comprehensive system verification and validation was performed by Cal Poly Pomona and Bronco Express. Section 6 describes the system verification and validation plans and the test procedures. It also provides detailed results of the system test.

Figure 5 Solar-Powered Sign at the Building 94 Bus Stop

Figure 6 Solar-Powered Sign at the University Village Bus Stop

Figure 7 System Testing

4.5 Bronco Express EDAPTS System Ribbon Cutting Ceremony

Following the successful installation of roadside information display signs and the testing of the Bronco Express EDAPTS System, Cal Poly Pomona hosted a ribbon cutting ceremony on January 8, 2009 (see Figure 8).

This ceremony marked the opening day of using the Bronco Express EDAPTS System as an integral part of the University shuttle bus service system. The ceremony provided marketing opportunities to promote the use of the system. Reporters from Cal Poly Pomona's newspaper, *PolyCentric*, wrote and published an article to introduce the Bronco Express EDAPTS System to students, faculty, and staff of Cal Poly Pomona. Reporters from the local newspaper, San Gabriel Valley Tribune, also wrote and published an article entitled "Cal Poly Pomona develops small transit system for mass use" to describe the Bronco Express EDAPTS System. The Inland Empire Daily Bulletin considered the use of solar energy as an innovative green ITS solution, providing excellent benefits to everyone in the Cal Poly Pomona community.

Figure 8 The Solar-Powered Sign Is Officially Unveiled at the Bronco Express EDAPTS Inauguration Ceremony

5. OVERVIEW OF THE INSTALLED BRONCO EXPRESS EDAPTS SYSTEM

The Bronco Express EDAPTS System utilizes a service-based business model. The system supplier operates and maintains the system for Cal Poly Pomona through a comprehensive service agreement. This service agreement provides all aspects of maintenance and operations, including all recurring and non-recurring costs required for continued day-to-day operation of the system.

System components are connected to the system supplier's data center, which is located at the system supplier's main facility in Los Angeles, California. The data center houses the Bronco Express system server, receiving and analyzing vehicle location and passenger loading information from all buses, and transmitting the data back in various formats to all system elements located on the Cal Poly campus and to the web clients.

Table 1 shows how the Bronco Express System components as they appear in the EDAPTS RFP, the supplier's proposal, and in the final installed system. Figure 9 shows a graphical overview of the installed system.

Table 1 System Components in the EDAPTS RFP, System Supplier's Proposal, and Installed System

	EDAPTS Components	Requested in RFP	Pledged in System supplier's Proposal	Implemented
1	Provide 8 sets on onboard equipment, including AVL, MDT, emergency button, automatic passenger counter, wireless communications	Yes	**Yes**	**Yes**
2	Vehicle-to-central site wireless communications system	Yes	**Yes**	**Yes**
3	Central Site Server Software	Yes	**Yes**	**Yes**
4	Transit Management Dispatch Client Software	Yes	**Yes**	**Yes**
5	Provide 4 dynamic messaging signs with wireless communications at bus stops	Yes	**Yes**	**Yes**
6	Dynamic messaging sign wireless communications system	Yes	**Yes**	**Yes**

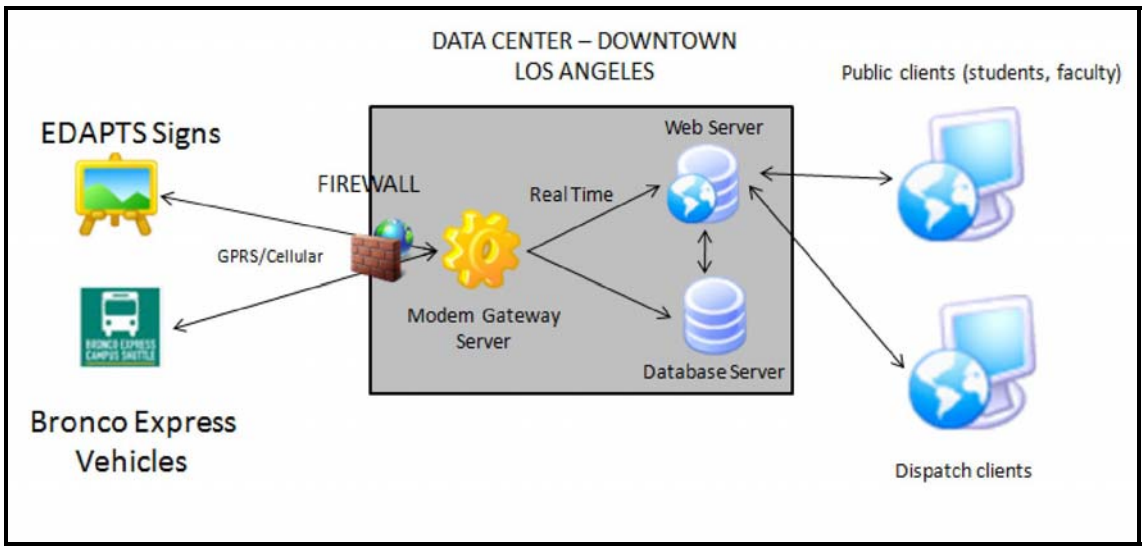

Figure 9 Installed Bronco Express EDAPTS System

5.1 Bronco Express Vehicle On-Board Equipment/Vehicle-to-Central Site Wireless Communication System

Vehicle on-board subsystems were installed in all eight Bronco Express shuttle buses, including buses owned by Cal Poly Pomona and those owned by Laidlaw. The equipment installed consists of an AVL Modem, a Mobile Data Terminal (MDT), and an Automatic Passenger Counter (APC).

Mobile Data Terminals

The MDT provides the system interface to drivers, and allows:

- Drivers to log on to the Bronco Express EDAPTS System using Bronco Express employee ID and route number
- Drivers and dispatchers to send text-based messages to each other
- Drivers to declare an on-board emergency that sends a notification to the dispatch clients
- Fuel percentage readings to be entered at the end of a driver's shift
- Drivers to log out of the Bronco Express EDAPTS System
- Administrative functions to be accessed

Automatic Passenger Counting

The APC, installed above the doors on each Bronco Express bus, collects boarding and alighting passenger information and transmits the information to the AVL unit. The AVL unit then assembles and sends the passenger information to the data center. The passenger information is time stamped and linked to the bus stop where the boarding and alighting events occurred.

Automatic Vehicle Location/Wireless Communications System

The AVL unit installed on Bronco Express buses assembles information from MDTs, APCs, and engine diagnostics and transmits the collected information to the data center through a cellular data network.

5.2 Bronco Express Dispatch Clients

Bronco Express Dispatch Clients are a web-based application that can only be accessed by the PTS manager and dispatchers using web browsers such as Firefox and Internet Explorer. These portals use password protected interfaces to limit access to the Central Site Software and the Transit Management Dispatch Client Software. Figure 10 shows the main screen presented by a dispatch client, which includes a fleet status table, a map-based display on the upper-right part of the window, and a listing of vehicle emergencies in the lower-right part of the window.

System Map

The system map shown in Figure 10 is a sample screen shot of the website. The Bronco Express Dispatch Client provides operational information such as vehicle location, passenger loading, speed, and direction in real-time for each vehicle in the fleet. This information is updated and refreshed once every seven seconds. PTS managers and dispatchers using the system map can visually see the location of all the Bronco Express buses, the passenger loading (in terms of percentage vehicle capacity used), the routes the buses are serving, and the speed of each bus.

Using the system map, PTS managers and dispatchers can also playback the exact positions of buses serving a route in previous days or months. This vehicle history display function shows the position, speed, time and direction of a specific bus during a specified time interval and date. The vehicle history output also displays passenger-loading information at each stop during the report period.

Fleet Status

The Fleet Status table as shown in Figure 10 provides information about bus number, ignition status, speed and direction, and minutes since last position received for each bus. The buses on the Fleet Status table can be sorted by name, ignition status, or last date and time of position

check in. They can also be grouped based upon vehicle type, ownership, or other desired characteristics determined during system configuration.

Route & Driver Management

The Dispatch Client provides a set of tools for managing drivers and routes within the Bronco Express system. Using these tools, PTS managers and dispatchers can modify the name and color of a route in the display, change the name of a stop, delete a stop or path for a route, add a new stop or path, and edit the name of a stop.

The Dispatch Client provides bus assignment and schedule assignment functions, allowing buses to be automatically assigned to a route and schedules to be linked to a specific route. It provides a driver assignment function to allow drivers to be assigned to their buses and routes. The schedules can be assigned in either time intervals or using specific stop times. Currently the Bronco Express does not utilize the schedule assignment function.

Arrival Prediction

Bus arrival prediction is one of the functions of the Transit Management Dispatch Client Software. The installed system uses the Bronco Express Dispatch Clients to display arrival predictions to the PTS manager and/or dispatchers. These arrival predictions are provided to the public through web portals, via mobile phones, ADA-compliant shelter signs, and call-in phone systems.

Emergency and incident Repsonses

The Dispatch Client allows dispatchers to be alerted when a bus goes outside of a specified perimeter area or over a set speed threshold. These alerts are stored in a log and emailed to desiginated dispatchers. The Dispatch Client also sends out emergency alert mesesages via email to desiginated individuals (i.e. PTS managers and dispatchers) when an emegercy button on a MDT is activated.

Reports

The Dispatch Client provides PTS managers and dispatchers with a set of operational reports. One of the reporting functions is to view information related to the status of a bus at each stop it makes. Information provided includes: stop name, arrival time, departure time, time between previous and current departures, time since the bus was last at a stop, time between previous departure time and the current departure time, and number of passengers that boarded and exited the bus at the stop.

The Dispatch Client can summarize passenger information for each stop on a hourly, daily, or monthly basis or on a custom, dispatcher specified period. The passenger information is provided in Microsoft Excel tables and charts.

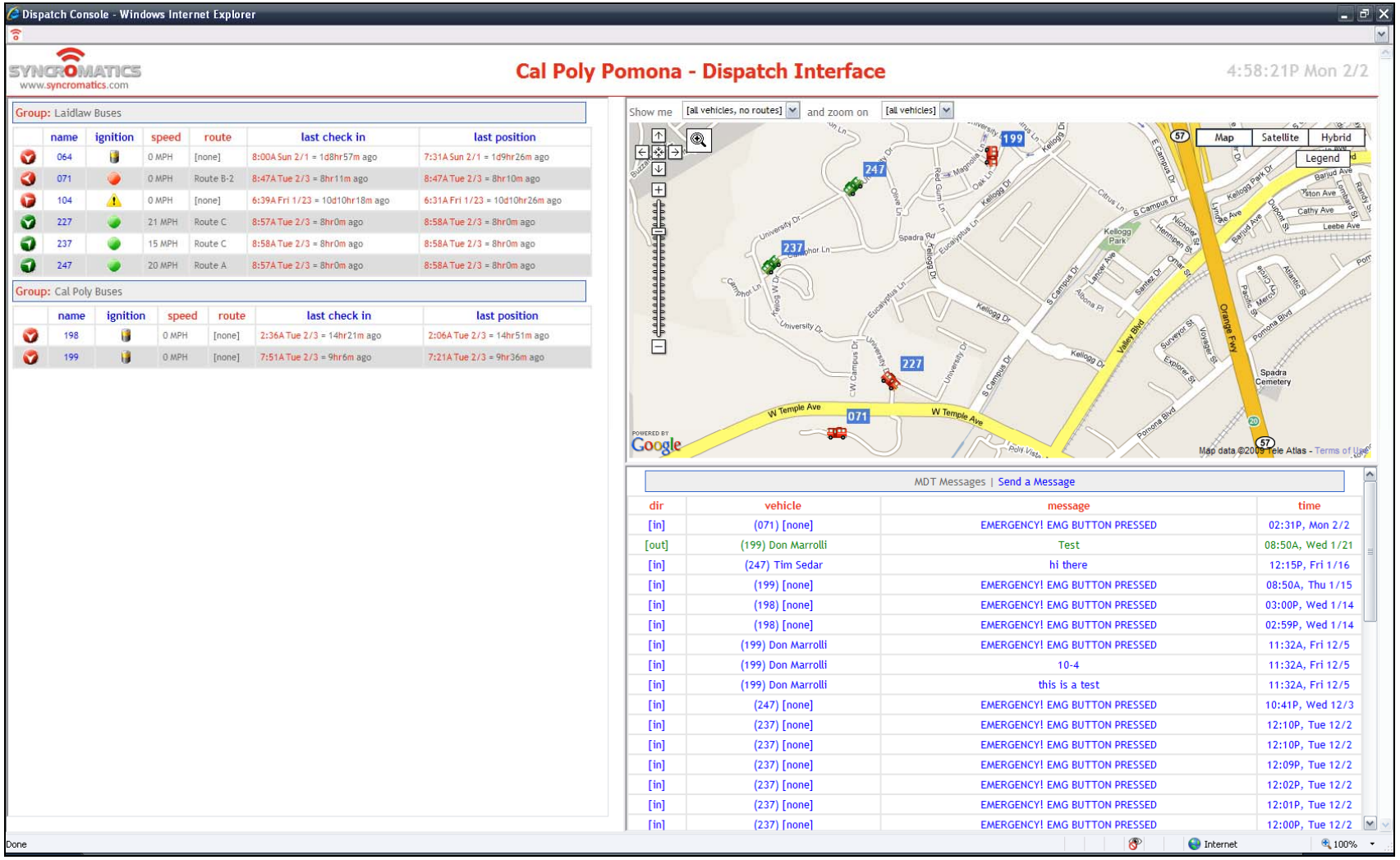
Dispatch Console - Windows Internet Explorer
SYNCROMATICS
www.syncromatics.com
Cal Poly Pomona - Dispatch Interface
4:58:21P Mon 2/2
Group: Laidlaw Buses
name | ignition | speed | route | last check in | last position
064 | 0 MPH | [none] | 8:00A Sun 2/1 = 1d8hr57m ago | 7:31A Sun 2/1 = 1d9hr26m ago
071 | 0 MPH | Route B-2 | 8:47A Tue 2/3 = 8hr11m ago | 8:47A Tue 2/3 = 8hr10m ago
104 | 0 MPH | [none] | 6:39A Fri 1/23 = 10d10hr18m ago | 6:31A Fri 1/23 = 10d10hr26m ago
227 | 21 MPH | Route C | 8:57A Tue 2/3 = 8hr0m ago | 8:58A Tue 2/3 = 8hr0m ago
237 | 15 MPH | Route C | 8:58A Tue 2/3 = 8hr0m ago | 8:58A Tue 2/3 = 8hr0m ago
247 | 20 MPH | Route A | 8:57A Tue 2/3 = 8hr0m ago | 8:58A Tue 2/3 = 8hr0m ago
Group: Cal Poly Buses
name | ignition | speed | route | last check in | last position
198 | 0 MPH | [none] | 2:36A Tue 2/3 = 14hr21m ago | 2:06A Tue 2/3 = 14hr51m ago
199 | 0 MPH | [none] | 7:51A Tue 2/3 = 9hr6m ago | 7:21A Tue 2/3 = 9hr36m ago
Show me [all vehicles, no routes] and zoom on [all vehicles]
Map Satellite Hybrid
Legend
W Temple Ave
Orange Fwy
Spadra Cemetery
Kellogg Park
Google
Map data ©2009 Tele Atlas - Terms of Use
MDT Messages | Send a Message
dir | vehicle | message | time
[in] | (071) [none] | EMERGENCY! EMG BUTTON PRESSED | 02:31P, Mon 2/2
[out] | (199) Don Marrolli | Test | 08:50A, Wed 1/21
[in] | (247) Tim Sedar | hi there | 12:15P, Fri 1/16
[in] | (199) [none] | EMERGENCY! EMG BUTTON PRESSED | 08:50A, Thu 1/15
[in] | (198) [none] | EMERGENCY! EMG BUTTON PRESSED | 03:00P, Wed 1/14
[in] | (198) [none] | EMERGENCY! EMG BUTTON PRESSED | 02:59P, Wed 1/14
[in] | (199) Don Marrolli | EMERGENCY! EMG BUTTON PRESSED | 11:32A, Fri 12/5
[in] | (199) Don Marrolli | 10-4 | 11:32A, Fri 12/5
[in] | (199) Don Marrolli | this is a test | 11:32A, Fri 12/5
[in] | (247) [none] | EMERGENCY! EMG BUTTON PRESSED | 10:41P, Wed 12/3
[in] | (237) [none] | EMERGENCY! EMG BUTTON PRESSED | 12:10P, Tue 12/2
[in] | (237) [none] | EMERGENCY! EMG BUTTON PRESSED | 12:10P, Tue 12/2
[in] | (237) [none] | EMERGENCY! EMG BUTTON PRESSED | 12:09P, Tue 12/2
[in] | (237) [none] | EMERGENCY! EMG BUTTON PRESSED | 12:02P, Tue 12/2
[in] | (237) [none] | EMERGENCY! EMG BUTTON PRESSED | 12:01P, Tue 12/2
[in] | (237) [none] | EMERGENCY! EMG BUTTON PRESSED | 12:00P, Tue 12/2
Done
Internet
100%

Figure 10 Bronco Express Dispatch Interface

5.3 Bronco Express Public Client

The Bronco Express public client is a web-based application that can be accessed by the public using Web browsers such as Firefox and Internet Explorer. It uses a simplified and sanitized non-password protected interface similar to the Transit Management Dispatch Client Software, both of which are served with data from the supplier's data center. The public client is not able to access any of the system management functions provided to the dispatch and administrative users.

Figure 11 shows the main screen presented by a public client (see http://www.broncoshuttle.com), which includes a map-based display on the upper-right area and a list of user options for announcement and available service routes on the upper-left area. Users can visually see buses moving on the Google-based map, and get expected bus arrival time when they move their mouse cursor over stop icons. They can also obtain vehicle loading information by moving their mouse cursor over bus icons.

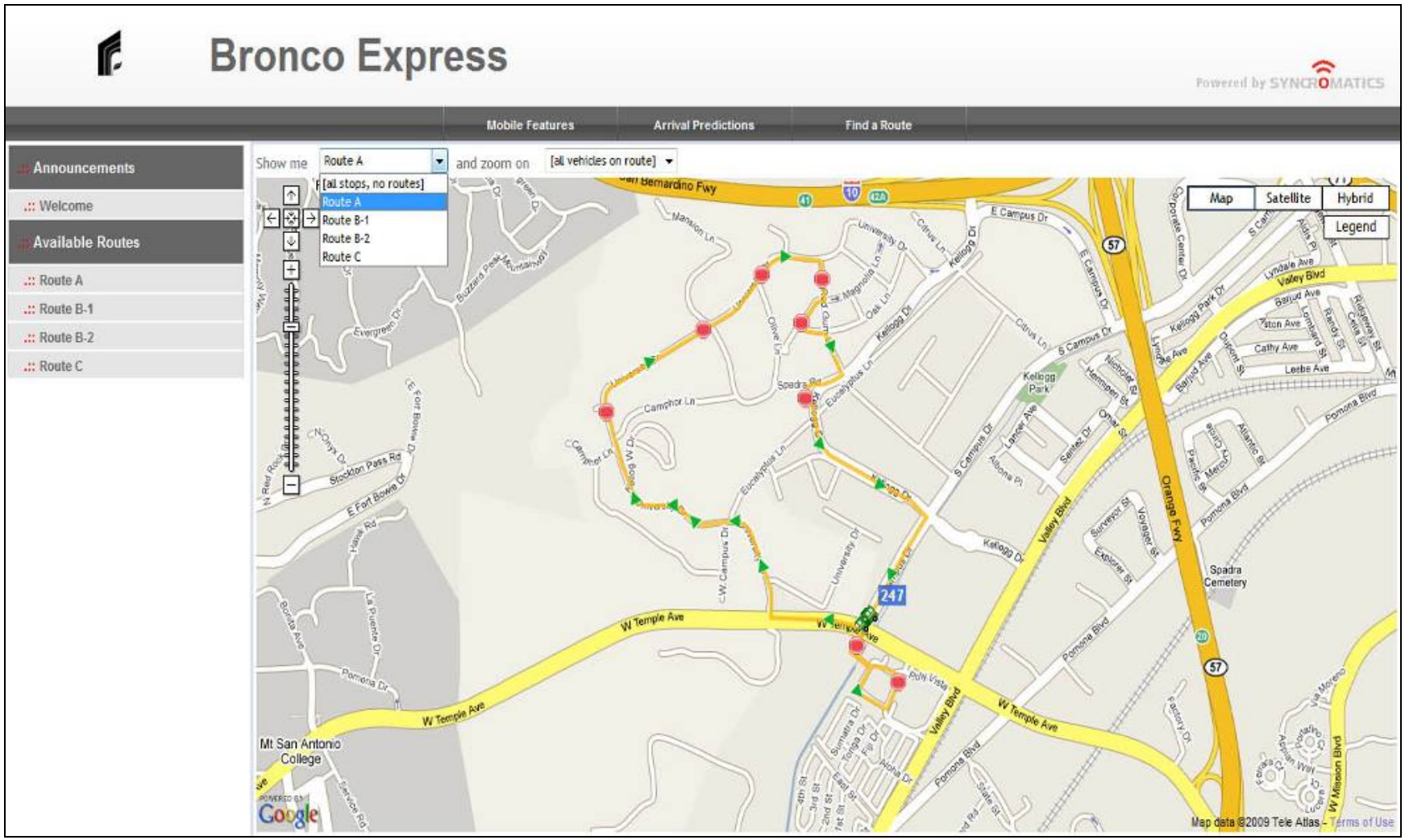

Figure 11 Bronco Express Public Client

5.4 Solar-Powered Signs/Sign-to-Central Site Wireless Communications System

The four solar-powered roadside information displays provide expected bus arrival time via a visible electronic sign array and an audible announcement detailing upcoming bus arrival time(s) at the stop. The signs visually show expected bus arrival time through a LED display. Pressing a push button on the signpost initiates an audible announcement of the expected bus arrival time. The button used is robust and able to withstand the rigors of daily use by riders. It is similar to the ones used to call for a WALK mode at signalized pedestrian crosswalks (see Figure 12).

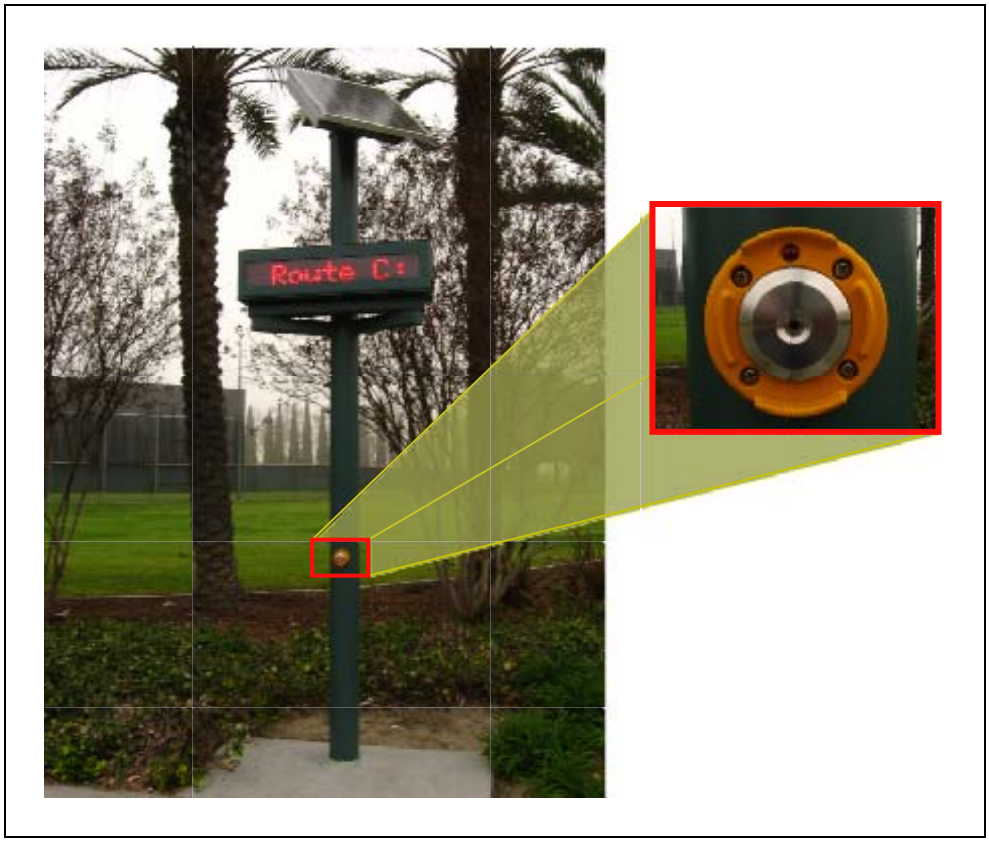

Figure 12 Audible announcement push button on the Signpost

6. BRONCO EXPRESS EDAPTS SYSTEM EVALUATION

Following installation and supplier's verification of the basic functionality, the research team started the research evaluation process. The purpose of the evaluation is to determine if the installed system is compliant with the user needs and the performance specifications as requested in the Bronco Express EDAPTS RFP.

The evaluation involves two types of testing: system verification and system validation. The system verification compares the performance metrics of the installed Bronco Express EDAPTS System to those described in the RFP. The system validation checks if all the user needs and requirements described in the RFP and Bronco Express EDAPTS Operations Guidelines are being met by the installed system.

The research team developed both a system verification plan and a system validation plan. Using the verification and the validation plans, the team worked with PTS and the system supplier to determine if all the EDAPTS performance objectives are being met by the installed system.

It is important to note that a failure of the installed system is defined as an instance that the system does not meet a particular validation or verification criteria as described in this document. However, a failure does not automatically indicate that the delivered system is non-compliant to the contractual agreement between Bronco Express and the selected system supplier. It may simply indicate that a performance-for-cost tradeoff was made at some point in the procurement process and the failure is the logical outcome of that tradeoff.

6.1 System Verification Plan and Testing

The Bronco Express system verification required an evaluation of the implementation of the features selected for procurement. These features, documented in the Test Deployment EDAPTS System Requirements and Performance Specification along with their associated metrics of performance, were an important part of the EDAPTS RFP. Each feature and metric were tested and rated as being compliant, non-compliant, or not applicable. This process provided the EDAPTS project with a set of verification results that along with the Validation testing assisted in the identification of several issues in the operational system, providing the research team with data to make recommendations for system improvement.

System Verification Plan

Due to the large number of features and metrics requiring verification, a System Verification Plan was created to assist researchers with the task. Metrics were categorized and grouped by the type of verification that was required:

1. Inspection
2. Testing
3. System supplier certification
4. System supplier-provided licensing

Metrics verified by inspection were generally required a true or false response to the testing of conformance. Metrics verified by testing were generally more involved, and hence required a test plan to determine their conformance. The conformance of metrics verified by system supplier certification or system supplier-provided licensing was established based on materials provided by the system supplier. The Verification Plan further broke these categories into general areas of verification such as on-board or roadside requirements to permit the research team to evaluate related metrics more quickly during the verification process.

To further assist with evaluation, test worksheets were created for each metric requiring inspection or verification. Each worksheet contained the identifier, title of the requirement, the specified requirements for the metric, and the verification methods specified by the performance specification generated during the operational requirements phase of the project (see Figure 13). Each worksheet also contained a verification procedure providing further detail for verifying the metric, and sections to be completed by the verifier of the metric. These written sections as shown in Figure 13 included (1) the detailed steps taken while verifying the metric, (2) a comments section on verification, (3) an indication as to whether the verification requirements were met or not, and (4) a signoff field with date of completion.

While the use of worksheet for each metric created a sizable testing document, it simplified verification evaluation by confining all information for each metric to a single page. This method allowed for division of labor during verification allowing all materials for a specific metric to be kept with the tester, and then easily reintegrated back into the testing document once verification was complete.

A summary of verification findings is provided in Appendix B, while the completed verification worksheets are included in Appendix C.

1.2.4	power_switch_MDT
EDAPTS Specification Identifier	**2.2.4.1**
Metric Requirement	**The MDT shall have an accessible power switch in the driver's compartment**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	**Review design documents provided by Syncromatics. Inspect the installed system**
Implementation:	
Comments:	
Verification Requirements Met	**YES** ❑ **NO** ❑
Signature:	**Date:**

Figure 13 Example Verification worksheet prior to use.

System Verification Testing

Verification of the Bronco Express EDAPTS system proceeded using the System Verification Plan, with testing performed and documented by the research team. Each metric was evaluated using the verification method and the procedure specified in the System Verification Plan. The research team conducted 129 field metric verifications of the installed EDAPTS system. The remaining 137 metrics were verified using a questionnaire sent to the system supplier to address the System supplier Certification and System supplier-provided Licensing sections of the Verification Plan. The questionnaire is provided in Appendix D.

System Verification Findings

The data recorded from the system verification worksheets were analyzed, detailing where project needs were met and where deficiencies were identified. Overall, many of the requirements laid out in the EDAPTS Performance Specification were met by the system supplier.

1. Documentation standards such as readability, style, and formatting were well met. Initially user manuals were not provided as set forth in the specifications, but were later supplied by the system supplier. A higher-level system manual including theory of operation and maintenance instructions was not provided. While the troubleshooting sections included in some of the user manuals were thorough and complete, not all manuals included a troubleshooting section.

2. Parts manufactured for both the roadside and vehicle onboard systems largely met all requirements, including part edge trueness, corrosion resistance, mounting-hole tolerance, and part commonality.

3. Vehicle Onboard components functioned reliably, providing consistent location updates to the system and users. However, very few parts bore manufacture nameplates, and some installed cables lacked both the necessary label markers and cable abrasion methods required under the specification. The locations of installed components were well laid out, and did not impede driver view of the road or regular operations. Despite all of this, the MDT offered only minimal functionality, providing emergency functionality and messaging capabilities. Most of the required driver feedback functionality was not implemented.

4. Roadside components also functioned reliably, providing clear minutes-until-arrival information to riders utilizing both visual and audible methods. The displays and their posts and foundations were solidly constructed, and met the requirements for weather and vandal resistance. ADA requirements for message display and clarity were also met. While the signs function admirably, they do not meet the required level of fourteen

days of solar autonomy, nor do they recharge from a fifty percent battery capacity level within the specified time duration.

Accuracy of the predicted arrival information was found to be questionable at times. Extensive testing and documentation of this core function was made during both the verification and validation phases of the evaluation to better understand the reasons for this inaccuracy and assist the system supplier in resolving the issue. The inaccuracy could be related to the supplier's algorithm used for predicting bus arrival time and the lack of traffic information on the bus routes.

5. The ATRMS client provided most of the features necessary to manage the fleet, including both map-based and tabular vehicle tracking displays. It also provided useful reports to the user, detailing both stop arrival times and passenger loading information. As with the rest of the system it did not provide schedule adherence support, a key RFP function required for operations. It also did not provide management or diagnostic functionality for either the onboard or roadside hardware. This functionality is less critical in a service-based system, but is still required as part of the original specification. The ability to broadcast public-service or banner-type messages on the roadside display signs was also missing from the client.

6. The central software and associated data store also provides most of the required functionality and supports most of the specified features such as data store management and backup, requirements related to capacity, security, and uptime, as well as response times for both data traversal through the software and to user queries. It does not provide open access to the data store nor the necessary documentation necessary for doing so.

The system as a whole met the capacity and support requirements set out in the specification, supporting far larger quantities of elements such as vehicles, drivers, stops, and routes than those set forth in the EDAPTS RFP. The system also meets all applicable state and Federal standards, including Department of Transportation (DOT) requirements for vehicle onboard components and Federal Communications Commission (FCC) licensing requirements for wireless data communications devices.

One of the primary deficiencies is the lack of schedule adherence capability throughout the system, as it has no concept of fixed-route scheduling. It also does not conform to the EDAPTS Data-Formatting Standard at any level of the system, detracting from the open-format ideal of EDAPTS and complicating the possibility of part-interchangeability and the modification or addition of new features in the future by the university or another system supplier.

6.2 System Validation Plan and Testing

The Bronco Express system validation required a comprehensive evaluation of the functionality described in each operational scenario (contained in the Bronco Express Operations Guidelines). Each operational scenario was tested live on the installed system to determine if the installed system provided the described system features and functions. All scenarios were tested and rated as either having full compliance, non-compliance, partial compliance, or not applicable. A partial compliance rating in a scenario indicates that the system met some, but not all objectives within that specific scenario. Using this process, the team discovered some issues and shortcomings of the installed system, and established a mechanism for monitoring system performance and developing recommendations for system improvements. The results of this effort provided the EDAPTS project with a set of validation findings that were beneficial to Bronco Express and potentially to other small transit agencies desiring to deploy their own EDAPTS system.

System Validation Plan

The validation of each operational scenario began with a detailed review of each scenario, identifying key elements, such as the specific conditions of the situation encountered, the user needs to be addressed, and the desired functional criteria to be validated. Please see the following sample operational scenario to help clarify the process used (see Figure 14). The important key elements to be addressed are underlined to bring attention to them.

Upon identification of all key aspects of a scenario, the research team then articulated all operational characteristics or user needs associated with this operational scenario in an easy to understand format. The characteristics gleaned from the below scenario are listed as follows:

- The system shall provide a bus schedule.
- The *Bronco Express Automatic Transit Arrival Sign* provides bus information for all routes, such as arrival times and “out of service” announcement.
- The system shall constantly update the shuttle arrival times on the *Bronco Express Automatic Transit Arrival Sign* at least every 7 seconds.
- Promotional material describing the Bronco Express EDAPTS System shall be provided to users (i.e. student, faculty and visitors using the shuttle service).

SAMPLE OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.1.1):

A professor walks up to a bus stop at 15 minutes before the hour to get a ride to his class. He knows that buses serving Routes A, B, and C pass through this stop, however he would like to catch Route B. He is not too concerned about being late to his class, since he knows the Route B bus is scheduled to arrive at the stop 12 minutes before the hour and will drop him off at his lecture destination at 3 minutes before the hour. This would allow him to be in his class by 1 minute after the hour and ready to teach at 10 minutes after.

The Bronco Express Automatic Transit Arrival Sign installed at the bus stop provides him with information for all routes by successively displaying the following messages:

"Rt A here in 10 minutes"

"Rt B here in 4 minutes"

"Rt C OUT OF SERVICE"

Each message is displayed for approximately 7 seconds, then the pattern repeats.

The professor notes Route B is running a minute late, but feels comfortable since the information displayed on the Bronco Express EDAPTS bus sign has demonstrated itself to be accurate. He also notes that Route C is not running and wonders if it is because the bus has had a mechanical failure or the driver is on break. He knows these are the most probable explanations because he read the promotional material distributed via email and in the CPP campus newspaper, Poly Post, when the new EDAPTS system was installed.

The Route B bus arrives as predicted at 11 minutes before the hour, the professor boards and the bus departs. The bus ends up gaining a little time on the way to his destination and arrives on schedule at 3 minutes before the hour.
The professor gets off the bus, walks to his classroom, and is on time.

Figure 14 Sample Operational Scenario for Validation Plan Development

Keeping these operational characteristics in mind, the research team then developed specific test steps and carried out those steps to validate the scenario. See the sample validation steps in the sample below.

Operational Scenario Validation Steps
1. Create a data collection sheet (or map) that chronicles and details the professor's (tester's) experience including his arrival at the initial bus stop, wait for the bus, ride on the bus, arrival at the last bus stop and walk to his final destination. 2. Take the planned validation trip, noting all times on the data collection sheet. 3. Record data and observations, including any special factors and impressions. Required observations are: 1. Did the system provide a bus schedule? 2. Did the *Bronco Express Automatic Transit Arrival Sign* provide bus information for all routes? 3. Did the shuttle arrival times on the *Bronco Express Automatic Transit Arrival Sign* update every 7 seconds? 4. Was promotional material for EDAPTS system provided?

The research team developed the overall System Validation Plan by creating an individual validation plan for each operational scenario included in the Bronco Express EDAPTS Operations Guidelines. This System Validation Plan is organized by the following sections, and can be found in Appendix E.

1. Riding the Bronco Express Shuttles
2. Driving the Bronco Express Shuttles
3. Dispatching Drivers and Vehicles
4. Managing Bronco Express Services
5. Laidlaw Management Tasks
6. Maintaining the EDAPTS System

<u>System Validation Testing</u>

Validation of the Bronco Express EDAPTS system commenced using the System Validation Plan. These test activities were carried out and documented by the research team. The resulting data, including any system performance measures addressed, were recorded in the validation data worksheets.

The system validation involved two distinct types of activities: (1) direct observation of the operational performance aspects of the installed system and (2) a questionnaire survey to the

system supplier. The research team conducted nineteen individual validation tests in the direct observation and measurement activity, including some statistical analyses of system performance measures. The survey activity utilized a questionnaire sent to the system supplier requesting responses to several technical and logistics based questions. This survey was developed by the research team and addressed eight sets of operational scenarios, primarily related to maintenance and troubleshooting issues associated with operation of the installed system.

System Validation Results

The data resulting from the system validation was recorded, analyzed, and a validation report was prepared showing where needs were met and where deficiencies were identified. The validation report is provided in Appendix E.

Table 2 shows a summary of the validation results. The validation test concluded that the installed system met the user needs and operational requirements described in sixteen operational scenarios. The installed system failed ten operational scenarios. The majority of the failures were in scenarios related to functionality of the MDT devices. The following table summarizes the results for each of the twenty seven validation tests.

Table 2 Summary of Validation Test

RIDING THE BRONCO EXPRESS SHUTTLES	
Operational Scenario	**Notes**
3.1.1[2] CPP professor walks up to a bus stop to catch a bus Pass / Fail / Not Validated	This scenario was successfully validated. Posing as a professor, the test observer felt very comfortable arriving at a stop and trusting the estimated arrival time displayed by the sign. The Bronco Express roadside information display was very valuable and helpful, keeping the observer informed as to when the desired bus was going to arrive. Because the Bronco Express system does not have a published schedule with exact stop times, the complete validation of this scenario was not possible. However, the installed EDAPTS system did provide expected bus arrival times to riders as envisioned.
3.1.2 CPP Student in the library needing to catch a bus Pass / Fail / Not Validated	This scenario was successfully validated. The web-services provided by the Bronco Express EDAPTS System are very effective in providing estimated bus arrival times. The website is very easy to navigate through and provides significant information on bus operations. It shows estimated arrival time, bus direction, bus passenger loads and the exact location of the bus on its route. The location of the bus is updated approximately every 7 seconds. The website also provides bus status (i.e. "out of service", "on route"). The estimated bus arrival time information displayed on the sign agrees with the information provided on the website.
3.1.3 CPP Student with a cell phone needing to catch a bus (Possible future feature) Pass / Fail / Not Validated	This scenario was not tested. The Bronco Express system does not provide a voicemail service.

[2] 3.1.1 refers to the Section 3.1.1 scenario in the System Validation Plan.

Table 2 Summary of Validation Test (Cont'd)

RIDING THE BRONCO EXPRESS SHUTTLES	
Operational Scenario	**Notes**
3.1.3A CPP Student with a cell phone needing to catch a bus Pass / Fail / Not Validated	This scenario was successfully validated. The text messaging feature provided a very easy way to find out the bus arrival time for any stop. The transaction time was faster than what was envisioned in the scenario and the estimated arrival time was accurate. Each bus stop had its own identification number which allowed only one text message to be sent in order to receive the bus arrival time.
3.1.4 CPP Student with a web-enabled cell phone needing to catch a bus[3] (Possible future feature) Pass / Fail / Not Validated	This scenario was successfully validated. The features provided by the website when accessed via a web-enabled phone are similar to the website features described in Section 3.1.2 of the Validation Plan. The mobile friendly website provides useful information including shuttle arrival time and a live map. This provided information makes it easy for anyone with a web-enabled phone to find the status of a shuttle. The small format sign described in the original scenario was not procured by Cal Poly Pomona and could not be tested.

Table 2 Summary of Validation Test (Cont'd)

[3] This scenario, different from Section 3.1.3 scenario, can access to the public website (http://www.broncoshuttle.com) of the Bronco Express EDAPTS System.

DRIVING THE BRONCO EXPRESS SHUTTLES	
Operational Scenario	**Notes**
3.2.1 Cal Poly or Laidlaw driver starting the day's work **Pass / Fail / Not Validated**	This scenario was not successfully validated. The power-up procedures of the MDT are different than envisioned. In the envisioned scenario, the MDT power depends on the ignition switch position, such that when the ignition is turned on, the MDT powers up. In the installed system, this is only true if the bus battery switch has been left in the "ON" position, and this is not the normal end of service situation. If the driver turns the battery switch to the "OFF" position, the MDT does not have power and will not power up by simply turning the ignition switch to the "ON" position. When the driver then turns the battery switch to the "ON" position and turns on the bus ignition switch, the driver is also required to press a MDT button to power up the MDT. In this scenario test, the MDT had not been powered up since the last time the battery switch had been changed from the "OFF" position to the "ON" position, preventing automatic power-up of the MDT. In addition, instead of the asking the driver to select his name and verify his personal ID number the MDT asked the driver to enter his personal ID number and verify his name. Although the login feature described in this scenario was a bit different, the login feature provided by the MDT did allow the driver to login to the MDT. Similarly, instead of the driver selected a route from a list of routes the driver was required to enter the route and then confirm it. During the login process the MDT did not prompt the driver to enter the vehicle's odometer reading as envisioned in the scenario. After the driver logged into the MDT, nothing else really happened on the MDT. The MDT did not display the stop where the driver would begin the route, did not start displaying the time in a large digital format and did not remove all other information when the driver reached a specified speed. In addition, the MDT went into a "power-save" mode after approximately one and a half minutes of inactivity. When the driver arrived at a stop the MDT did not indicate that the bus had arrived at the stop nor did it indicate and countdown a scheduled time to depart from the stop.

Table 2 Summary of Validation Test (Cont'd)

DRIVING THE BRONCO EXPRESS SHUTTLES	
Operational Scenario	**Notes**
3.2.2 Cal Poly or Laidlaw driver changing shift **Pass / Fail / Not Validated**	This scenario was conditionally validated. The MDT function did not provide a "Driver Shift Change" function, but it did provide log-in and log-out functions that could be used a similar way. The relieved driver can use the log-out function to sign out of the MDT and the relief driver can use the log-in function to sign into the MDT. Instead of prompting the relieved driver to input an odometer reading before logging out, the MDT prompted the driver to input a fuel percentage reading. After the relieved driver signed out, the relief driver was able to log-in from the main menu. Instead of selecting his name, the MDT required the relief driver to enter his Personal ID Number and confirm his name. Information relating to the shift change transaction might have been collected, stored and transmitted to the central site, but reports are not available to confirm this.
3.2.3 Cal Poly or Laidlaw driver logout **Pass / Fail / Not Validated**	This scenario was not successfully validated. Many features in this scenario were not available. For instance, the MDT does not determine the end of the driver's day. Also, the MDT does not record deadhead[4] miles. The driver is able to log-out using the MDT and is prompted for a fuel percentage level, but not an odometer reading as envisioned. Information relating to the log-out transaction might have been collected, stored and transmitted to the central site, but reports are not available to confirm this.
3.2.4 Cal Poly or Laidlaw driver on route and picking up passengers **Pass / Fail / Not Validated**	This scenario was not successfully validated. This scenario failed its validation test because none of the features are available. The MDT does not display the current time after arriving at a stop. A "CPP Rider" button is not available and the MDT does not show the time of day while the vehicle is in motion.

Table 2 Summary of Validation Test (Cont'd)

[4] Deadhead refers to a bus that transports no passengers during a trip.

DRIVING THE BRONCO EXPRESS SHUTTLES	
Operational Scenario	**Notes**
3.2.5 Cal Poly or Laidlaw driver on route and picking up passengers with automatic passenger counter (APC) (POSSIBLE FUTURE FEATURE) **Pass / Fail / Not Validated**	This scenario was not successfully validated. Although the buses are equipped with fully functional APCs the other features described in this scenario depend on the MDT and are not available. The MDT does not display APC passenger counts and there is not a "Riders On Board" counter available.

Table 2 Summary of Validation Test (Cont'd)

DRIVING THE BRONCO EXPRESS SHUTTLES	
Operational Scenario	**Notes**
3.2.6 Dangerous situation on bus **Pass / Fail / Not Validated**	This scenario was not successfully validated. The emergency button is not installed in the envisioned location (i.e. below the driver's left thigh) nor is it in an alternate area that is out of sight of passengers when pressed/activated. Once the button is pressed, the emergency message is sent as required, but it does not require the button to be held for more than 1.5 seconds. When the emergency button is pressed while the MDT is in a "power-save" mode, the emergency message is sent and the MDT is taken out of its "power-save" mode. When the emergency button is pressed, it immediately alerts the Cal Poly Pomona dispatcher but not the First Transit dispatcher. This is because the First Transit dispatcher has not been given access to the dispatch console functions. Should First Transit be given "dispatcher" access, this function would be available to them as well. The Cal Poly Pomona dispatcher is not alerted audibly and the on-screen visual alert itself is not as envisioned; the console does not flash and the emergency alert message looks the same as any other message sent from the MDT. When the emergency button is pressed the bus is not automatically put in a "GPS Tracking Mode", although bus updates frequency meets the envisioned rate. Buses can manually be put in a "tracking mode" during which the system map zooms in on the bus and follows its every move. The dispatch console is not locked out of its normal functions during the emergency notification process and the system never prompts the dispatcher to ask a coded question as envisioned. Observers Note: A few of these issues and failures might be more related to Bronco Express/PTS operational process limitations than with installed hardware/software issues.

Table 2 Summary of Validation Test (Cont'd)

DRIVING THE BRONCO EXPRESS SHUTTLES	
Operational Scenario	**Notes**
3.2.7 Going on break **Pass / Fail / Not Validated**	This scenario was not successfully validated. None of the envisioned MDT features were available. The MDT does not indicate the driver's scheduled arrival time at each stop as they arrive at the stop. The MDT does not know when the driver's break is and does not countdown the break time. The vehicle does not have an on vehicle electronic route sign that they can change to show "on-break" status and the MDT does not report arrivals and stops.
3.2.8 Fueling **Pass / Fail / Not Validated**	This scenario was not successfully validated. The MDT does not provide a fueling function. A driver is not prompted to enter a gallon amount or odometer reading during the fueling process. The number of gallons and odometer readings is not recorded by the MDT. The system does record fuel percentage readings at the end of a driver's shift (if entered by the driver), but this was not what was envisioned in this scenario.

Table 2 Summary of Validation Test (Cont'd)

DISPATCHING DRIVERS AND VEHICLES	
Operational Scenario	**Notes**
3.3.1 Dispatchers at work **Pass / Fail / Not Validated**	This scenario was successfully validated. The dispatcher console shows a system map to monitor real-time bus locations. The console has a system table that summarizes the fleet status. It is similar in appearance, but not exactly the same as the one described in the scenario. The system map updates bus location every seven seconds, more frequently than the once-per-minute envisioned. The fleet status information is updated every minute. The dispatcher is able to easily monitor the real-time bus location using the dispatcher console.
3.3.2 Dispatchers know where vehicles are **Pass / Fail / Not Validated**	This scenario was successfully validated. The test observer noted only one minor problem. Dispatchers are not able to see a name change in the fleet status table because the table itself does not provide a section for drivers' names. However, Cal Poly Pomona dispatchers are able to communicate with the drivers via a dedicated radio channel and First Transit dispatchers are able to communicate with the drivers using mobile phones. The dispatchers are able to monitor the buses at all times using the system map. The drivers are able to log-in and log-out of the MDT.
3.3.3 Dispatch bus with serious mechanical failure **Pass / Fail / Not Validated**	This scenario was not successfully validated. This is primarily because of MDT and console functions that are not provided. Neither the drivers nor the dispatchers are able to change the status of the buses on the fleet status table. The dispatcher' console also does not have an "Incident Clearance Report" button.

Table 2 Summary of Validation Test (Cont'd)

MANAGING BRONCO EXPRESS SERVICE	
Operational Scenario	**Notes**
3.4.1 Using passenger loading reports to optimize vehicle size **Pass / Fail / Not Validated**	This scenario was successfully validated. The reports provided by the system are very helpful. A Bronco Express manager is able to view reports showing daily, monthly, and yearly passenger loading reports for all routes.
3.4.2 Using schedule adherence reports to adjust schedule (Potential future feature) **Pass / Fail / Not Validated**	This scenario was not successfully validated. Although the system provides managers and administrative assistants with a Schedule and Schedule Adjust section, it does not have a function to adjust schedules based on the actual travel times experienced. Also, the system does not recommend a new bus schedule based on the statistical patterns derived from the actual travel time of buses on a specific route.

Table 2 Summary of Validation Test (Cont'd)

LAIDLAW MANAGEMENT TASKS	
Operational Scenario	**Notes**
3.5.1 Providing the monthly report to Cal Poly **Pass / Fail / Not Validated**	This scenario was successfully validated. A Bronco Express manager is able to generate a monthly report showing the passenger boarding of each stop. The report shows passenger loading for any time period specified. Reports are broken down to show the loading information for every stop in a drivers shift. The report shows the total number of passengers for each stop and route. Some minor problems exist in that the manager is not able to select the output report file type, the generated report is always given in Excel format only, and no "button" function is available to print the report.

Table 2 Summary of Validation Test (Cont'd)

MAINTAINING THE EDAPTS SYSTEM	
Operational Scenario	**Notes**
3.6.1 Schedule and route updates **Pass / Fail / Not Validated**	This scenario was successfully validated. The system provided many features for creating, modifying and deleting route schedules. If a route is added to a stop the signs will automatically recognize the new route. The system does not include a "button" to automatically deploy the schedule to all MDTs and real-time bus arrival signs as envisioned. MDTs do not incorporate support for route schedule information such as this.
3.6.2 Addition of new stops on a route **Pass / Fail / Not Validated**	This scenario was successfully validated. The MDT does not report GPS coordinates to the driver, but GPS coordinates are not required to add stops to a route. The addition of new stops on a route is a simple "click-n-add" process based only on the map display graphic.
3.6.3 On-board Hardware Maintenance **Pass / Fail / Not Validated**	This scenario was successfully validated. The MDT is physically easy to remove and reinstall. An MDT user manual is provided that showed all MDT wiring. However, the manual does not provide testing procedures to ensure that the MDT is working properly. Given the simplicity of the MDT, these procedures may not be strictly necessary, though they were envisioned. First Transit dispatchers aren't able to communicate with technicians through radios but Cal Poly Pomona dispatchers are.
3.6.4 Dispatch Console Maintenance **Pass / Fail / Not Validated**	This scenario was successfully validated. The dispatch console uses a web interface; consequently there is no need to install software for the dispatch console to work properly. If the dispatch console fails to work properly, Cal Poly Pomona personnel report the problem to the system supplier, who then affects repair. Once the system supplier fixes the problem, the PTS can determine if all EDAPTS dispatching functions are working properly using the Track Website User Manual provided by the system supplier.

Table 2 Summary of Validation Test (Cont'd)

MAINTAINING THE EDAPTS SYSTEM	
Operational Scenario	**Notes**
3.6.5 Vehicle to central dispatch communication link fails **Pass / Fail / Not Validated**	This scenario was conditionally validated. The manuals provided by the system supplier do not provide troubleshooting guidelines or system diagnostic tools related to this scenario. Since this is envisioned as a system wide failure, Cal Poly Pomona simply needs to contact the system supplier who then affects repair.
3.6.6 On-board equipment fails **Pass / Fail / Not Validated**	This scenario was not successfully validated. Although the driver is able to send messages to the dispatcher via the MDT and the system supplier provides RMA (Return Merchandise Authorization) paperwork, the MDT does not indicate a failure in the APC and the APC's power could not be cycled by the driver.
3.6.7 Transit sign fails **Pass / Fail / Not Validated**	This scenario was successfully validated. Although the sign does not display an "Out Of Service" message, it does announce an "Out Of Service" message (audibly) that provides an error code to be given to the system supplier. Timestamps are recorded for the last time a device was reported to the servers, and more detailed failure logs are kept on the devices as well.
3.6.8 Computer console or server fails **Pass / Fail / Not Validated**	This scenario was successfully validated. The dispatch console does display warning messages at the bottom left corner of the screen when an error occurs. If a problem occurs with the dispatch console, Cal Poly Pomona is only responsible for contacting the system supplier. The system supplier is responsible for updating the dispatch services and fixing any problems like the one envisioned in this scenario.

7. CONCLUSIONS

The Bronco Express EDAPTS System, as installed and operated at the Cal Poly Pomona campus, consists of eight sets of vehicle on-board subsystems (including AVL units, APCs, and MDTs), four solar-powered signs, and two web sites. This system is designed to provide a low-cost ITS solution for operational needs identified by the Parking and Transportation Services of Cal Poly Pomona.

The EDAPTS research team, observing the Bronco Express EDAPTS System installation process and working with system supplier and PTS personnel, developed the system verification plan, the validation plan and associated test procedures. Using these test plans and procedures, the research team verified the installed subsystems and functionality against those required in the RFP, those provided in the system supplier's proposal and those described in the Bronco Express EDAPTS Operations Guidelines.

System verification was a process of inspecting, testing, and investigating EDAPTS system performance against the EDAPTS specifications set forth in the EDAPTS RFP. The verification used a methodical approach derived from the detailed and hierarchically organized EDAPTS performance specification utilized. The research team concluded that the installed EDAPTS system largely meets all performance specifications, although it fell short in some key areas. Generally, these failures were in areas originally specified by the EDAPTS RFP, but were not promised by the system supplier.

The data from the system validation was recorded, analyzed, and documented in the validation report. The validation test concluded that the installed system met overall user needs and operational requirements. However, the installed system did fail ten operational scenarios and the majority of the failures were in scenarios related to functionality of the MDT. For example, the MDT (1) did not display the stop where the driver would begin the route, (2) did not start displaying the time in a large digital format once the driver started driving and (3) did not display the current arriving at a stop. The system supplier is aware of the MDT limitations and is planning to upgrade the MDT features for the installed EDAPTS system through the service agreement.

The system verification and validation demonstrated in this project proved to be very effective in determining how well the installed EDAPTS system met the system functional requirements and the operational characteristics and user needs described in the EDAPTS RFP. The processes and test procedures developed by the team ensured that the verification and validation tests are repeatable and well documented.

8. REFERENCES

- Xudong Jia and Jeff Gerfen. “Bronco Express EDAPTS System Procurement Documentation Package.” Technical Report, California PATH and Caltrans, 2008.

- Xudong Jia, Edward Sullivan, Cornelius Nuworsoo, and Neil Hockaday. “EDAPTS Cost/Benefit Evaluation.” Technical Report, California PATH and Caltrans, 2007.

- Jeff Gerfen, Neil Hockaday. “Development of Performance-Based Specifications for Efficient Deployment of Advanced Public Transportation Systems (EDAPTS), Technical Report, California PATH and Caltrans, 2007.

- Xudong Jia, Jeff Gerfen, Neil Hockaday. “Task Order 6403: Cal Poly Pomona EDAPTS Test Deployment Operations Description, Version 6.0.”, Technical Report, California PATH and Caltrans, 2007.

- US Department of Transportation. “System Engineering for Intelligent Transportation Systems: An Introduction for Transportation Professionals.” January 2007.

9. APPENDICIES

Appendix A Structural Design of Sign Posts and Site Layout Design of Sign Foundations

Appendix B Summary of System Verification Findings

Appendix C Completed System Verification Worksheets

Appendix D Questionnaire to System Supplier

Appendix E Bronco Express EDAPTS System Validation Plan and Results

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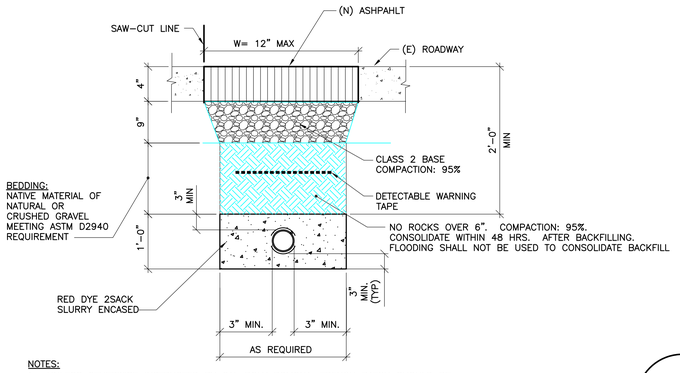
CALIFORNIA POLYTECHNIC
UNIVERSITY, POMONA
3801 WEST TEMPLE AVE
POMONA, CALIF 91768

AEPC Group, LLC
DESIGN • CONSTRUCTION • MANAGEMENT

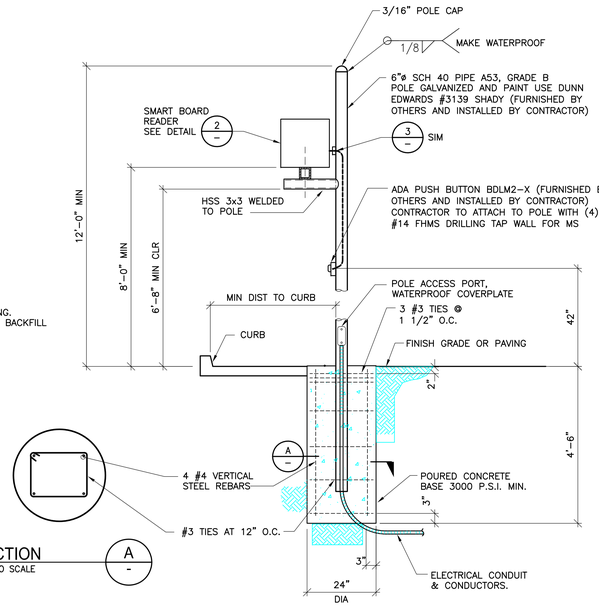
Southern California Office
2850 Red Hill Ave, Suite 240
Santa Ana, CA 92705
Telephone: 949-224-1590 / Facsimile: 949-261-8681

Northern California Office
5000 Executive Parkway, Suite 475
San Ramon, CA 94583
Telephone: 925-277-3050 / Facsimile: 925-824-0102



NOTES:
1. UNLESS OTHERWISE INSTRUCTED BY CAL POLY POMONA, TRENCH PATCH SHOULD BE STRAIGHT GRADE ACROSS WIDTH; SHOULD NOT BE CROWNED AT CENTER, AND SHALL BE 1/8 " HIGHER THAN ADJACENT EXISTING LANDSCAPE.

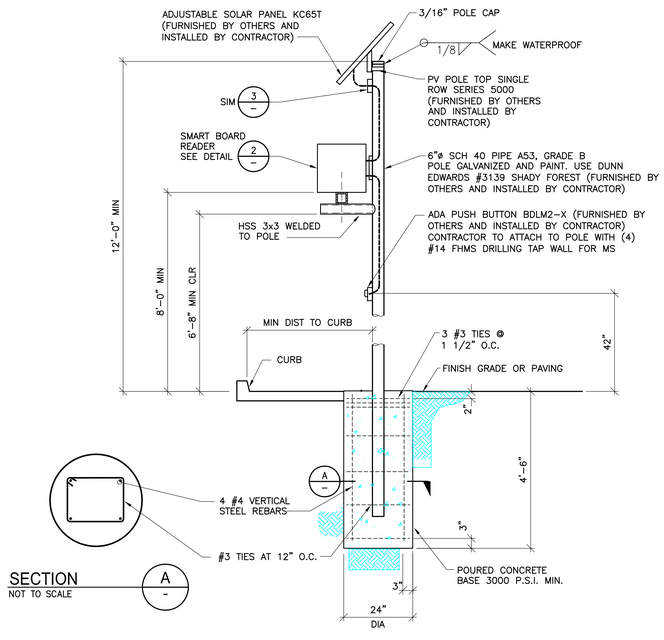
UNDERGROUND CONDUIT DETAIL 6
SCALE: NTS


3/16" POLE CAP
1/8
MAKE WATERPROOF
6"ø SCH 40 PIPE A53, GRADE B POLE GALVANIZED AND PAINT USE DUNN EDWARDS #3139 SHADY (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR)
SMART BOARD READER SEE DETAIL 2
3 SIM
HSS 3x3 WELDED TO POLE
ADA PUSH BUTTON BDLM2-X (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR) CONTRACTOR TO ATTACH TO POLE WITH (4) #14 FHMS DRILLING TAP WALL FOR MS
12'-0" MIN
8'-0" MIN
6'-8" MIN CLR
MIN DIST TO CURB
CURB
POLE ACCESS PORT, WATERPROOF COVERPLATE
3 #3 TIES @ 1 1/2" O.C.
FINISH GRADE OR PAVING
42"
2"
4'-6"
4 #4 VERTICAL STEEL REBARS
#3 TIES AT 12" O.C.
POURED CONCRETE BASE 3000 P.S.I. MIN.
3"
3"
24" DIA
ELECTRICAL CONDUIT & CONDUCTORS.

SECTION A
NOT TO SCALE

NOTE:
1. USE THIS DETAIL FOR LOCATION #3 ONLY ALONG WITH DETAIL 5

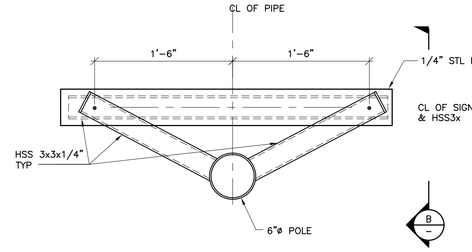
POLE DETAIL - MESSAGE BOARD ONLY 4
NOT TO SCALE


ADJUSTABLE SOLAR PANEL KC65T (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR)
3/16" POLE CAP
1/8
MAKE WATERPROOF
SIM 3
PV POLE TOP SINGLE ROW SERIES 5000 (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR)
SMART BOARD READER SEE DETAIL 2
6"ø SCH 40 PIPE A53, GRADE B POLE GALVANIZED AND PAINT. USE DUNN EDWARDS #3139 SHADY FOREST (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR)
HSS 3x3 WELDED TO POLE
ADA PUSH BUTTON BDLM2-X (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR) CONTRACTOR TO ATTACH TO POLE WITH (4) #14 FHMS DRILLING TAP WALL FOR MS
12'-0" MIN
8'-0" MIN
6'-8" MIN CLR
MIN DIST TO CURB
CURB
3 #3 TIES @ 1 1/2" O.C.
FINISH GRADE OR PAVING
42"
2"
4'-6"
4 #4 VERTICAL STEEL REBARS
#3 TIES AT 12" O.C.
POURED CONCRETE BASE 3000 P.S.I. MIN.
3"
3"
24" DIA

SECTION A
NOT TO SCALE

NOTE:
1. USE THIS DETAIL FOR LOCATION #1, #2, AND #4

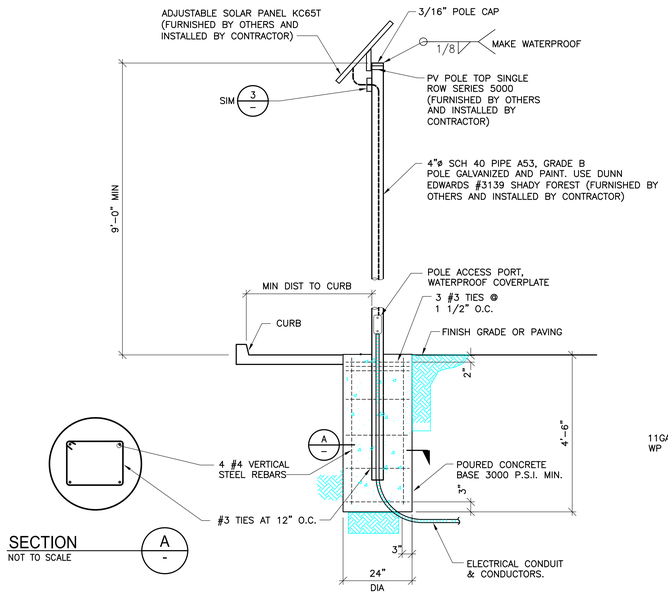
POLE DETAIL 1
NOT TO SCALE



PLAN VIEW
SCALE: 1 1/2" = 1'-0"

LEGEND:

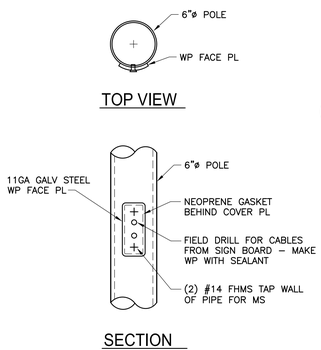
MIN	MINIMUM
ø	ROUND
O.C.	ON CENTER
P.S.I.	POUND PER SQUARE INCH
DIA.	DIAMETER
STL.	STEEL
PL.	PLATE
CLR	CLEAR
RHMS	ROUND HEAD MACHINE SCREW
FHMS	FLAT HEAD MACHINE SCREW
WP	WATER PROOF
GALV	GALVANIZED
HSS	HOLLOW STRUCTURAL SECTION
MS	MACHINE SCREW


ADJUSTABLE SOLAR PANEL KC65T (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR)
3/16" POLE CAP
1/8
MAKE WATERPROOF
SIM 3
PV POLE TOP SINGLE ROW SERIES 5000 (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR)
4"ø SCH 40 PIPE A53, GRADE B POLE GALVANIZED AND PAINT. USE DUNN EDWARDS #3139 SHADY FOREST (FURNISHED BY OTHERS AND INSTALLED BY CONTRACTOR)
9'-0" MIN
MIN DIST TO CURB
CURB
POLE ACCESS PORT, WATERPROOF COVERPLATE
3 #3 TIES @ 1 1/2" O.C.
FINISH GRADE OR PAVING
2"
4'-6"
4 #4 VERTICAL STEEL REBARS
#3 TIES AT 12" O.C.
POURED CONCRETE BASE 3000 P.S.I. MIN.
3"
3"
24" DIA
ELECTRICAL CONDUIT & CONDUCTORS.

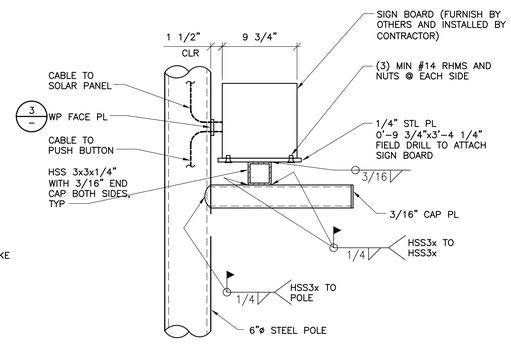
SECTION A
NOT TO SCALE

NOTE:
1. USE THIS DETAIL FOR LOCATION #3 ONLY ALONG WITH DETAIL 4

POLE DETAIL - SOLAR PANEL ONLY 5
NOT TO SCALE


6"ø POLE
WP FACE PL
TOP VIEW
11GA GALV STEEL WP FACE PL
6"ø POLE
NEOPRENE GASKET BEHIND COVER PL
FIELD DRILL FOR CABLES FROM SIGN BOARD – MAKE WP WITH SEALANT
(2) #14 FHMS TAP WALL OF PIPE FOR MS
SECTION

FACE PLATE DETAIL 3
SCALE: 1 1/2" = 1'-0"


1 1/2" CLR
9 3/4"
SIGN BOARD (FURNISH BY OTHERS AND INSTALLED BY CONTRACTOR)
(3) MIN #14 RHMS AND NUTS @ EACH SIDE
CABLE TO SOLAR PANEL
3
WP FACE PL
CABLE TO PUSH BUTTON
HSS 3x3x1/4" WITH 3/16" END CAP BOTH SIDES, TYP
1/4" STL PL 0'-9 3/4"x3'-4 1/4" FIELD DRILL TO ATTACH SIGN BOARD
3/16
3/16" CAP PL
1/4
HSS3x TO HSS3x
HSS3x TO POLE
6"ø STEEL POLE

SECTION B
SCALE: N.T.S.

SIGN BOARD SUPPORT DETAIL 2
SCALE: 1 1/2" = 1'-0"

ISSUES/REVISIONS

NO.	DATE	DESCRIPTION
B	12/03/08	100% SUBMITTAL
A	11/26/08	90% SUBMITTAL

SMART TRANSIT POLE

CALIFORNIA STATE POLYTECHNIC UNIVERSITY POMONA

3801 WEST TEMPLE AVE.
POMONA, CALIFORNIA
91768

DRAWN BY:	DESIGNED BY:	CHECKED BY:	APPROVED BY:

PROJECT NUMBER: CPP1-8-165
SCALE: AS NOTED

DETAILS

C1.2

FILE: N:\AEC\Project Files\CPP1 Projects\CPP1-8-165 (SMART Transit Pole)\CAD\CPP1-8-165_C-12_details.dwg Dec 03, 2008 - 4:21pm $(GETVAR,PT) jcd
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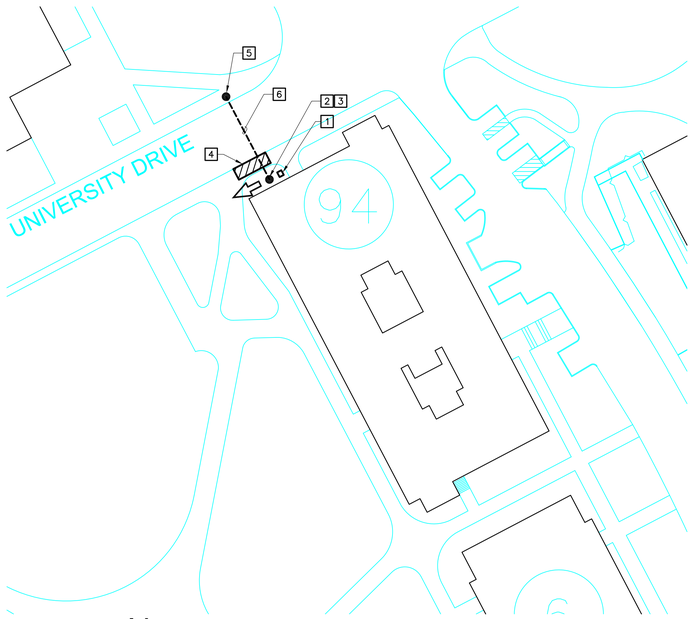
COPYRIGHT © 2002 AEPC GROUP, LLC



SMART TRANSIT SIGN #3:

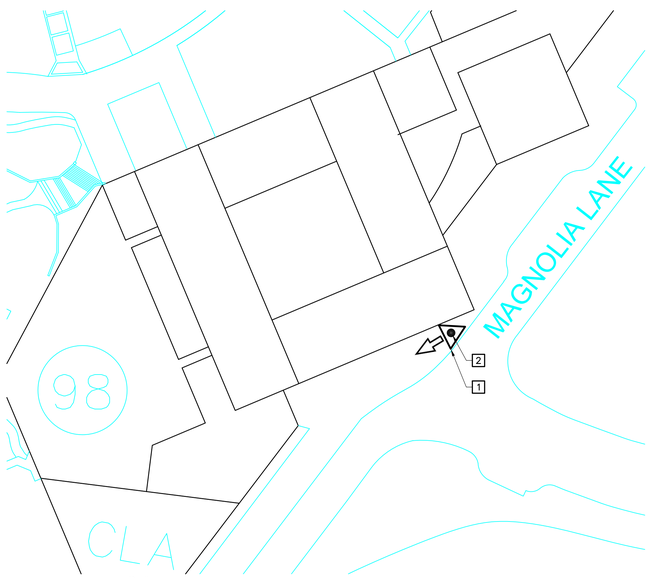
1. RELOCATE EXISTING "BUS STOP" SIGN
2. PROVIDE AND INSTALL NEW 3'–0"x3'–0"x4" THICK CONCRETE PAD CONCRETE SHALL BE 2500 psi AND SUBMIT MIX DESIGN TO CAL POLY POMONA AND OBTAIN APPROVAL PRIOR TO INSTALLATION. FINISH FOR NEW CONCRETE SHALL MATCH EXISTING AND SURROUNDING CONDITIONS.
3. NEW POLE WITH MESSAGE BOARD SHALL BE LOCATED NO CLOSER THAN A MINIMUM OF 1'–0" FROM ANY OTHER POLE/SIGNAGE OR EQUAL OR GREATER HEIGHT. REFER TO DETAIL 4 ON DRAWING C1.2 FOR ADDITIONAL INFORMATION.
4. REMOVE EXISTING CONCRETE SIDEWALK (APPROXIMATE: 7'–10" x 8'–9" AND REPLACE WITH NEW CONCRETE SIDEWALK. CONCRETE SHALL BE 2500 PSI AND SUBMIT MIX DESIGN TO CPP AND OBTAIN APPROVAL PRIOR TO INSTALLATION.
5. NEW POLE WITH SOLAR PANEL SHALL BE LOCATED NO CLOSER THAN A MINIMUM OF 1'–0" FROM ANY OTHER POLE/SIGNAGE OR EQUAL OR GREATER HEIGHT. REFER TO DETAIL 5 ON DRAWING C1.2 FOR ADDITIONAL INFORMATION.
6. ROUTE NEW (2) #4/0 AND (1) #6 GND WIRE IN NEW 2" CONDUIT THAT WILL CONNECT FROM THE NEW POLE WITH SOLAR PANEL TO THE NEW POLE WITH THE MESSAGE BOARD ACROSS UNIVERSITY DRIVE. REFER TO DETAIL 6 ON DRAWING C1.2 FOR ADDITIONAL INFORMATION.

LEGEND:

- ● APPROXIMATE LOCATION OF POLE
- ⇦ FACING DIRECTION OF SIGN

N

SMART TRANSIT SIGN #3 — 3 / -
SCALE: 1" = 40'–0"



SMART TRANSIT SIGN #4:

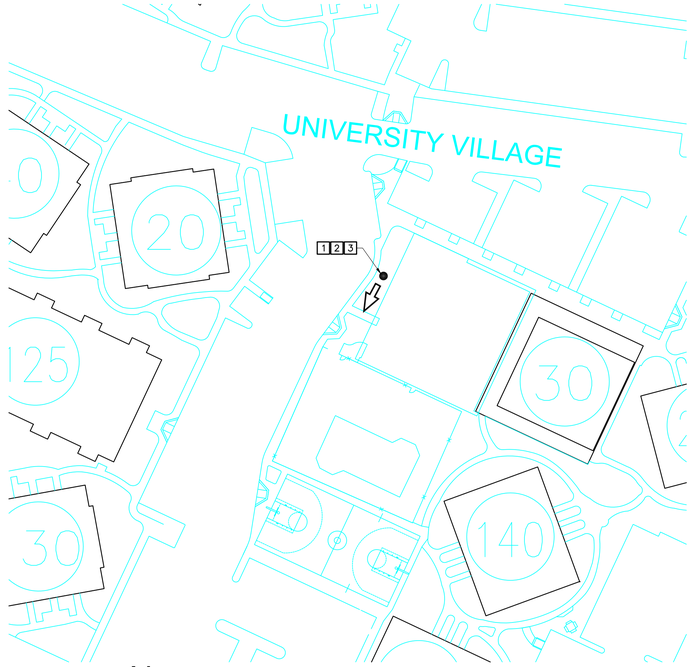
1. REMOVE EXISTING CONCRETE TRIANGLE FOR THE INSTALLATION OF NEW POLE. PROVIDE AND INSTALL NEW CONCRETE AND CAULKING MATERIAL THAT MATCHES EXISTING CONDITIONS. COORDINATE WITH CPP FOR THE STRENGTH, AND FINISH COLOR OF EXISTING CONCRETE AT THIS LOCATION.
2. LOCATE NEW POLE WITH MESSAGE BOARD AND SOLAR PANEL SHALL BE LOCATED IN THE CENTER OF THE NEW TRIANGLE. REFER TO DETAIL 1 ON DRAWING C1.2 FOR ADDITIONAL INFORMATION.

LEGEND:

- ● APPROXIMATE LOCATION OF POLE
- ⇦ FACING DIRECTION OF SIGN

N

SMART TRANSIT SIGN #4 — 4 / -
SCALE: 1" = 40'–0"



SMART TRANSIT SIGNS #1 AND #2:

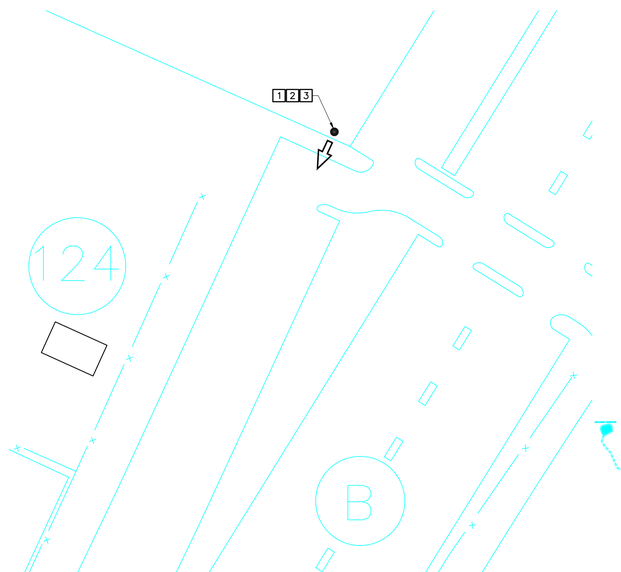
1. REMOVE AND CLEAR 3'–0"x3'–0" AREA OF EXISTING SHRUBS FOR NEW POLE. COORDINATE WITH CAL POLY POMONA AND REROUTE EXISTING LANDSCAPE PIPING AND SPRINKLER HEADS AS REQUIRED.
2. PROVIDE AND INSTALL NEW 3'–0"x3'–0"x4" THICK CONCRETE PAD CONCRETE SHALL BE 2500 psi AND SUBMIT MIX DESIGN TO CAL POLY POMONA AND OBTAIN APPROVAL PRIOR TO INSTALLATION. FINISH FOR NEW CONCRETE SHALL MATCH EXISTING AND SURROUNDING CONDITIONS
3. NEW POLE WITH MESSAGE BOARD AND SOLAR PANEL SHALL BE LOCATED NO CLOSER THAN A MINIMUM OF 1'–0" FROM ANY OTHER POLE/SIGNAGE OR EQUAL OR GREATER HEIGHT. REFER TO DETAIL 1 ON DRAWING C1.2 FOR ADDITIONAL INFORMATION.

LEGEND:

- ● APPROXIMATE LOCATION OF POLE
- ⇦ FACING DIRECTION OF SIGN

N

SMART TRANSIT SIGN #1 — 1 / -
SCALE: 1" = 40'–0"



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SMART TRANSIT SIGN #2 — 2 / -
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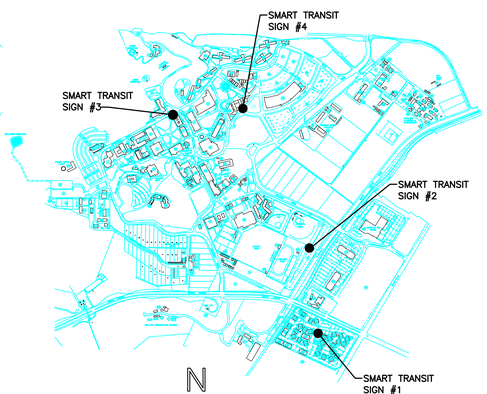

N

KEYPLAN
SCALE: N.T.S

CALIFORNIA POLYTECHNIC UNIVERSITY, POMONA
3801 WEST TEMPLE AVE
POMONA, CALIF 91768

AEPC Group, LLC
DESIGN • CONSTRUCTION • MANAGEMENT

Southern California Office
2850 Red Hill Ave, Suite 240
Santa Ana, CA 92705
Telephone: 949-224-1590 / Facsimile: 949-261-8681

Northern California Office
5000 Executive Parkway, Suite 475
San Ramon, CA 94583
Telephone: 925-277-3050 / Facsimile: 925-824-0102

ISSUES/REVISIONS

NO.	DATE	DESCRIPTION
B	12/03/08	100% SUBMITTAL
A	11/26/08	90% SUBMITTAL

SMART TRANSIT POLE

CALIFORNIA STATE POLYTECHNIC UNIVERSITY POMONA

3801 WEST TEMPLE AVE.
POMONA, CALIFORNIA
91768

DRAWN BY:	DESIGNED BY:	CHECKED BY:	APPROVED BY:

PROJECT NUMBER: CPP1–8–165
SCALE: 1"=10'–0"

SMART TRANSIT POLE LOCATION PLANS

C1.1

FILE: N:\AE\Project Files\CPP1 Projects\CPP1-8-165 (SMART Transit Pole)\CAD\CPP1-8-165_C-11_PLANSb.dwg Dec 03, 2008 - 4:21pm $(GETVAR,??) jld
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CALIFORNIA STATE POLYTECHNIC UNIVERSITY
POMONA, CALIFORNIA

SMART TRANSIT POLE

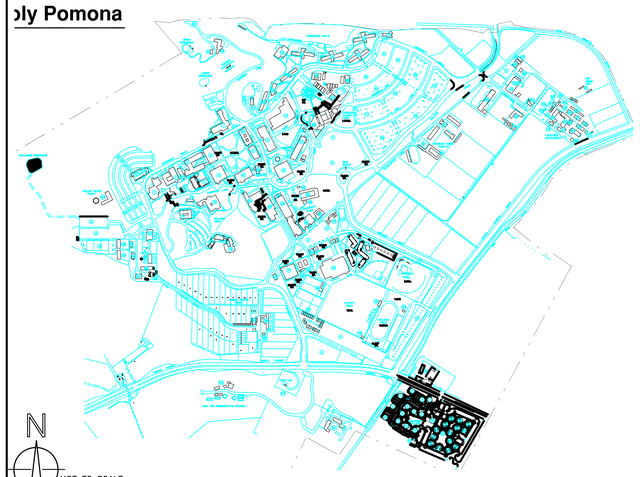
PROJECT GENERAL SPECIFICATIONS

1. IT IS THE INTENT OF THESE DOCUMENTS THAT A COMPLETE AND WORKABLE INSTALLATION BE PROVIDED. TO THIS END, THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT, TOOLS, SUPERVISION, TRANSPORTATION, WAREHOUSING, AND OTHER SERVICES REQUIRED TO COMPLETE THE WORK IN AN EFFICIENT AND TIMELY MANNER.
2. ALL WORK, INCLUDING MATERIALS AND WORKMANSHIP, SHALL CONFORM WITH ALL FEDERAL, STATE AND LOCAL CODES AND REGULATIONS, AND THE FOLLOWING CODES, STANDARDS AND REGULATIONS:

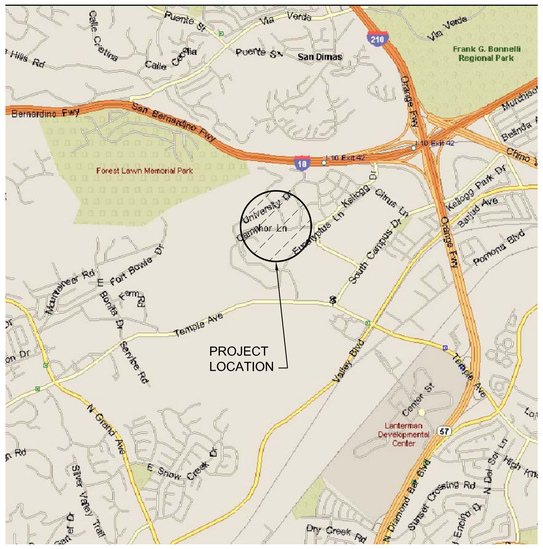
   APPLICABLE CODES AS OF JANUARY 1, 2008

   - 2007 CALIFORNIA BUILDING CODE
3. CONTRACTOR SHALL FURNISH, INSTALL/ERECT AND MAINTAIN FOR THE DURATION OF HIS WORK, ALL GUARD RAILS, LIGHTS, WARNING SIGNS, STAGING, VENTILATION, ETC. REQUIRED BY LOCAL AND STATE LAWS AND ORDINANCES, INCLUDING THE SAFETY ORDERS OF OSHA.
4. CONTRACTOR SHALL PROTECT EXISTING BUILDINGS AND FACILITIES FROM DAMAGE. ANY DAMAGE CAUSED BY THE CONTRACTOR SHALL BE REPAIRED TO OWNER'S SATISFACTION AND AT NO ADDITIONAL EXPENSE TO THE OWNER.
5. DO NOT SCALE DRAWINGS. BEFORE PROCEEDING WITH THE WORK, CONTRACTOR SHALL CAREFULLY CHECK AND VERIFY ALL DIMENSIONS, SIZES, REQUIRED CLEARANCES AND SHALL ASSUME FULL RESPONSIBILITY FOR THE FITTING OF ALL EQUIPMENT AND MATERIALS HEREIN REQUIRED TO OTHER PARTS OF THE WORK AND TO THE WORK OF OTHER TRADES.
6. ALL MATERIAL REMOVED AND NOT SCHEDULED FOR REUSE SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND THE CONTRACTOR SHALL LEGALLY DISPOSED OF AND TRANSPORT THIS MATERIAL OFF-SITE.
7. A WARRANTY PERIOD OF A MINIMUM OF 2 YEAR TO BE APPLIED TO ALL MATERIAL AND WORKMANSHIP.
8. REFER TO CFC ARTICLE 87 FOR FIRE SAFETY DURING CONSTRUCTION.

CAMPUS MAP



VICINITY MAP



NOTE: SEE THOMAS GUIDE PAGES 639 & 640.

SHEET INDEX

T0.1 TITLE SHEET, GENERAL NOTES, PROJECT DATA AND SHEET INDEX

CIVIL

C1.1 SMART TRANSIT POLE LOCATION PLANS

C1.2 DETAILS

PROJECT INFORMATION

OWNER:	CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA
OWNER ADDRESS:	3801 WEST TEMPLE AVENUE POMONA, CALIFORNIA 91768
PROJECT ADDRESS:	3801 WEST TEMPLE AVENUE POMONA, CALIFORNIA 91768
PROJECT DESCRIPTION:	• INSTALLATION OF FOUR (4) NEW POLES THAT WILL SUPPORT A NEW SMART TRANSIT MESSAGE BOARD AND SOLAR PANEL FOR POWER

CALIFORNIA POLYTECHNIC UNIVERSITY, POMONA
3801 WEST TEMPLE AVE
POMONA, CALIF 91768

AEPC Group, LLC
DESIGN • CONSTRUCTION • MANAGEMENT

Southern California Office
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Telephone: 949-224-1590 / Facsimile: 949-261-8681

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Telephone: 925-277-3050 / Facsimile: 925-824-0102

ISSUES/REVISIONS

NO.	DATE	DESCRIPTION
B	12/03/08	100% SUBMITTAL
A	11/26/08	90% SUBMITTAL

SMART TRANSIT POLE

CALIFORNIA STATE POLYTECHNIC UNIVERSITY POMONA

3801 WEST TEMPLE AVE.
POMONA, CALIFORNIA
91768

DRAWN BY:	DESIGNED BY:	CHECKED BY:	APPROVED BY:

PROJECT NUMBER: CPP1-8-165
SCALE: AS NOTED

TITLE SHEET, GENERAL NOTES, PROJECT DATA, AND SHEET INDEX

T0.1

FILE: N:\AEC\Project Files\CPP1 Projects\CPP1-8-165 (SMART Transit Pole)\CAD\CPP1-8-165_T0.1.dwg Dec 03, 2008 - 4:20pm $(GETVAR,PT) jcd
XREF: X-CAMPUS.dwg X-CPP1-GBR-E.dwg

Cal Poly Pomona Deployment Feature Verification

EDAPTS Specification		Implemented and Verified
1. Inspection		
1.1 General Requirements		
1.1.1.1	All documents shall be presented clearly and concisely, and reflect writing of at least a 12th grade level.	**Yes**
1.1.1.2	All documents shall be clearly understandable by audiences with 12th grade reading comprehension level.	**Yes**
1.1.1.3	All documents shall conform to the MIL-STD-962D documentation standard, section 4.7 for clarity.	**Yes**
1.1.1.4	All documents shall conform to the U.S. Government Printing Office Style Manual for style and grammar.	**Yes**
1.1.1.5	All cables and wires on wiring diagrams shall utilize unique identifiers which match physical labels on cables.	**No**
1.1.1.6	All wiring diagram inter-page connections shall be clearly marked at the left or right hand side of the page with the wire or cable's unique identifier.	**n/a**
1.1.1.9	The System Manual shall include a Theory of Operation outlining the operation of the system and how it functions.	**No**
1.1.1.10	The System Manual shall be comprehensive and cover all system-operation scenarios in clear step-by-step details.	**No**
1.1.1.11	The System Manual shall include clear step-by-step instructions for troubleshooting any potential system problems.	**No**
1.1.1.12	The System Manual shall include clear step-by-step instructions for installing the EDAPTS system.	**No**
1.1.1.13	The System Manual shall include clear step-by-step instructions for all necessary routine or scheduled maintenance procedures.	**No**
1.1.1.14	The User Manual shall be comprehensive and cover all user operation scenarios in clear step-by-step detail.	**Yes**
1.1.1.15	The User Manual shall include clear step-by-step instructions for troubleshooting common potential problems.	**No**
1.1.3.1	All devices displaying information to or requiring information from a user shall be easy to use and display clear operational usage instructions to the user.	**Yes**
1.1.5.4	All parts having the same manufacturer's part number are functionally and physically interchangeable.	**Yes**

EDAPTS Specification		Implemented and Verified
1.1.5.1	Any non-radiused external part edges shall be smooth, straight, and true.	Yes
1.1.5.2	All installed physical parts shall have smoothed (radiused / non-sharp) corners.	Yes
1.1.5.3	All physical parts shall be manufactured to within the given tolerance of their specified dimensions.	Yes
1.1.5.8	All installed cables shall utilize cable clamps, split loom, cable raceways, or other similar methods to minimize cable abrasion along the length of the cable.	No
1.1.8.1	All installed parts shall bear a manufacturer's nameplate or sticker, containing the manufacturer's name, product part number and revision as applicable, and serial number.	No
1.1.8.2	All field-installed interface wires and cables shall use suitable guage, shielding, and color for the application in conformance with applicable SAE and state and federal DOT standards.	Yes
1.1.8.3	All installed interconnect cables shall bear a cable marker at six inches from each end of the cable, and at regular intervals along the cable.	No
1.1.8.5	All equipment and accessories shall be a product of good workmanship and shall be free from any defects that will affect their appearance or serviceability.	Yes
1.1.1.7	All wiring diagrams shall reflect individual signal levels for multi-conductor cables.	No
1.1.1.8	System wiring diagrams shall indicate all individual conductors/signals by unique identifier.	No
1.1.4.2	The transit property shall have the ability to self-maintain all system Elements due to the availability of spare parts and the capability to retain a supply of spares.	n/a
1.1.8.8	In case of conflict between regulatory body, classification and international regulations and requirements, and this specification, the more stringent requirement shall take precedence.	Yes
1.1.8.12	If extension of an EDAPTS protocol is deemed necessary, it shall be done in a manner that does not interfere or break compatilbility with existing data elements, and shall not duplicate or otherwise repeat existing functionality.	No
1.1.8.13	All vendor-developed software shall be written in an industry standard, high level, non-proprietary language.	Yes
1.1.8.6	All installed equipment shall share Component-level part commonality, allowing for ease of swappage or replacement with minimal reconfiguration.	Yes

EDAPTS Specification		Implemented and Verified
1.1.8.7	All user or maintenace accessible hardware (including mounting hardware) shall share Component-level part commonality, and also at the system-wide level where possible.	**Yes**
1.1.4.1	All system elements shall be installable by qualified transit property personnel.	**Yes**
1.2 On-Board Requirements		
2.1.3.1	All On-Board System element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.	**n/a**
2.1.3.2	All On-Board System element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.	**n/a**
2.1.4.1	All power connections shall be fused or circuit breaker protected at the source connection.	**Yes**
2.2.4.7	The MDT shall receive APC boarding and alighting data from the APC, display a cumulative count to the driver, associate this data with stops during the day, and incorporate the data into the stop record transmitted to the central site for each stop.	**Yes**
2.5.13.1	Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the MDT and the automatic passenger counter shall be provided by the vendor upon delivery.	**Yes**
2.5.14.2	The APC unit shall count boardings and alightings and provide data to the MDT.	**No**
3.1.2.1	All On-Board Communications element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.	**n/a**
3.1.2.2	All On-Board Communications element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.	**n/a**
3.1.3.1	All power connections shall be fused or breakered at the source connection.	**Yes**
2.4.11.1	Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the MDT wireless data-communications system driver and the on-board wireless data interface shall be provided by the vendor upon delivery.	**No**
2.5.14.1	The APC shall be able to have collected data retrieved remotely.	**Yes**
2.6.16.1	Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the MDT and the emergency actuator shall be provided by the vendor upon delivery.	**No**

EDAPTS Specification		Implemented and Verified
1.3 Roadside Requirements		
4.1.2.1	All Roadside Information Display element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.	**Yes**
4.1.2.2	All Roadside Information Display element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.	**Yes**
5.1.2.1	All Roadside Communications element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.	**n/a**
5.2.2.2	All Roadside Communications element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.	**n/a**
4.3.8.1	Roadside Information Display post shall meet applicable state and federal DOT standards for crash safety.	**Yes**
4.4.9.1	Roadside Information Display foundations and posts shall comply with the Uniform Building Code with regard to wind resistance.	**Yes**
4.4.9.2	Roadside Information Display foundations and posts shall be earthquaqe resistant when installed in earthquake-prone areas.	**Yes**
8.1.3.2	The Central Site Software shall provide self-test diagnostics to aid in fault isolation.	**No**
8.5.10.1	Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the CSS vehicle communications system driver and the central site wireless data interface shall be provided by the vendor upon delivery.	**No**
1.4 Central Software Requirements		
6.7.11.1	The ATRMS consoles shall have the capability to track transit vehicles via map-based and tabular display.	**Yes**
6.8.13.1	The ATRMS consoles shall have the capability to track transit vehicle schedule adherence information and display it to the user.	**No**
6.9.16.1	The ATRMS consoles shall have the capability to track transit vehicle loading information and display it to the user.	**Yes**
6.10.18.1	The ATRMS consoles shall have the capability to compile and present ridership reports for the user.	**Yes**
6.11.20.1	The ATRMS consoles shall have the capability to compile and present schedule adherence reports for the user.	**No**
6.12.23.1	The ATRMS consoles shall have the capability to allow the user to administer all system users and their permissions.	**Yes**

EDAPTS Specification		Implemented and Verified
2. Verification & Testing		
2.1 General Requirements		
1.1.7.2	Mayday messages initiated by the driver shall be received with the specified percent reliability.	**Yes**
1.1.6.1	Raw passenger fare or pass identification numbers or strings that directly identify a specific rider may not be stored anywhere in the EDAPTS system or transmitted across any EDAPTS communications link. Any obsfucation method of these numbers must be one-way and non-reversible, preventing the transformation back to a raw ID number or string.	**n/a**
1.1.8.4	Null values shall be used when initializing or creating any data or data types, or recording an out-of-range value.	**No**
2.2 On-Board Requirements		
2.1.1.1	On-board devices shall not impede driver's view of the road, normal driver operations, movement in the driver's or passenger compartments, nor entry or egress from the vehicle.	**Yes**
2.1.2.1	The maximum amount of time required to remove and replace an On-Board system element.	**n/a**
2.1.2.2	The On-Board systems shall provided self-test diagnostics to aid in fault isolation.	**No**
2.2.2.1	The maximum amount of time the MDT shall take to respond to driver or passenger input for normal (non-emergency) operations.	**Yes**
2.2.2.9	The Mobile Data Terminal shall be capable of validating, logging, and forwarding to the central site the specified number of vehicle location and status per minute.	**Yes**
2.2.4.2	The MDT shall have a large format clock to display time to the driver when the coach is in motion	**No**
2.2.4.3	The MDT shall display bus stop name to the driver upon arrival at a stop.	**No**
2.2.4.4	The MDT shall display bus stop arrival schedule adherence information to the driver when at a stop.	**No**
2.2.4.5	The MDT shall display countdown until departure in minutes to a driver while at a stop or on break.	**No**
2.2.4.11	The MDT shall have the capability to detect arrivals and departures from stops, when at a stop, and when between stops based on the transit schedule and master stop list.	**No**
2.2.4.15	The MDT shall have the capability to log boarding and alighting data for retreival and post processing.	**Yes**

EDAPTS Specification		Implemented and Verified
2.2.4.16	The MDT shall have the capability to be remotely administered from the central site.	**Yes**
2.2.4.17	The MDT shall have the capability to log stop departure and arrival data for retreival and post processing.	**Yes**
2.2.4.18	The MDT shall have the capability to declare on-board emergencies to central dispatch and then send regular position updates to the central site.	**Yes**
2.2.4.19	The MDT shall have the capability to survey route stops for latitude, longitude, and direction (heading).	**No**
2.2.4.20	The MDT shall have the capability to communicate with the central site to support administrative functions such as software updates, schedule downloads, and retrieval of data logged on the MDT.	**Yes**
2.2.4.21	The MDT shall have the capability to perform a comprehensive self-test upon power up.	**No**
2.2.4.22	The MDT shall have the capability to log boarding and alighting data for retreival and post processing.	**No**
2.2.5.1	The MDT controls and interface shall be easily operable by the driver without requiring a significant shift from driving position.	**Yes**
2.2.5.2	The MDT display shall be clearly readable by the driver from its installation location as he or she conducts normal operations. The MDT display shall maintain clear readability under both day and night-time conditions.	**Yes**
2.2.5.4	The MDT shall provide a simple, easy to use, uncluttered interface to the driver. All commonly used actions such as log-in, log-out, and route-change shall be easily accesible and provide integrated step-by-step instructions. Buttons and screen controls shall be easily used and activated.	**Yes**
2.2.5.5	The MDT shall require minimal interaction by the driver as during normal driver operations.	**Yes**
2.2.7.1	The MDT shall detect stops with the specified percent reliability when GPS is available.	**No**
2.2.8.1	The Mobile Data Terminal shall detect when the vehicle is in motion, and shall blank its screen to prevent driver distraction. Display of the time in large characters is acceptable.	**Yes**
2.2.9.2	Time estimates shall be accurate within the specified number of seconds.	**Yes**

EDAPTS Specification		Implemented and Verified
2.6.17.1	The Emergency Actuator shall be operable from the driver's position, and shall able to unobtrusively activated in the event of an emergency. The actuator shall be resistant to accidental activation due to normal movement in the driver's compartment.	**No**
2.6.19.1	The emergency actuator shall not allow false signaling of an emergency.	**No**
3.1.1.1	On-Board System elements shall be able to be removed and replaced within the specified amount of time.	**Yes**
3.1.1.2	The On-Board Wireless Communications system shall provide self-test diagnostics to aid in fault isolation.	**Yes**
9.2.2.1	Latitude and longitude estimates shall be accurate to within the specified number of minutes.	**Yes**
2.2.4.12	The MDT shall have the capability to prompt a driver for their ID number upon login, and then associate the ID number with an ID number / name cross reference in the MDT.	**Yes**
2.2.4.13	The MDT shall have the capability to prompt a driver for route number upon login.	**Yes**
2.2.4.14	The MDT shall have the capability to prompt the driver for a route number during a route change during the day.	**Yes**
2.2.5.3	All sounds, tones, or other audible feedback generated by the MDT shall be of sufficient volume to be audible in the driver's compartment above background vehicle noise.	**No**
3.1.3.3	Minimum period of autonomous operation required to support emergency functionality in the event of a power loss.	**Yes**
2.3 Roadside Requirements		
4.1.1.1	Roadside Information Display elements shall be able to be removed and replaced within the specified amount of time.	**n/a**
4.1.1.2	The Roadside Information Display shall provided self-test diagnostics to aid in fault isolation.	**No**
4.2.3.2	The Dynamic Roadside Information Display shall be capable of receiving and then displaying banner messages up to the given character limit.	**No**
4.2.3.4	The Dynamic Roadside Information Display shall have the capability to present minutes until arrival for buses arriving at a stop based on real-time bus trajectory.	**Yes**
4.2.3.5	The Dynamic Roadside Information Display shall have the capability to indicate when it is out of service to passengers waiting at a stop.	**Yes**

EDAPTS Specification		Implemented and Verified
4.2.3.6	The Dynamic Roadside Information Display shall be capable of supporting the optional dissemination of information to riders with hearing and sight disabilities in accordance with the Americans with Disabilities Act (ADA).	**Yes**
4.2.7.1	Estimated minutes until arrival shall be accurate to within the specified number of seconds.	**No**
5.1.1.1	Roadside Information Display elements shall be able to be removed and replaced within the specified amount of time.	**n/a**
5.2.1.1	Maximum time for vehicle-update messages sent from the CSS to be received by the RID under typical system load conditions.	**Yes**
5.2.1.3	The Roadside Information Display Communications system shall have a sufficient throughput rate to ensure that all vehicles in the fleet with the specificed update frequency.	**Yes**
4.2.3.1	The RID shall be able to have configuration and system schedule information downloaded to it remotely from the central site.	**n/a**
4.2.3.3	The Dynamic Roadside Information Display shall be capable of storing and then displaying at least the given number of individual public service banner messages.	**No**
2.4 Software Requirements		
6.1.1.1	The maximum amount of time the ATRMS shall take to respond to operator input for vehicle tracking operations.	**Yes**
6.1.2.2	The central software shall be capable of supporting at least the given number of simultaneous emergency conditions.	**Yes**
8.8.18.1	Traveler Information API time estimates shall be accurate within the specified number of seconds.	**No**
2.5 Client Software Requirements		
6.1.3.1	The ATRMS GUI shall be readable by employees of varying visual capabilities.	**Yes**
6.1.3.2	ATRMS display fonts shall be scalable from small to large.	**No**
6.1.4.1	Minimum period of autonomous operation required to support emergency functionality in the event of a power loss should be 1 hour.	**n/a**
6.2.1.1	The ATRMS consoles shall have the capability to allow the user to remotely administer the On-Board Systems aboard each vehicle.	**No**
6.3.3.1	The ATRMS consoles shall have the capability to allow the user to build a schedule, disseminate it to the fleet, and track the schedule version on each vehicle in the fleet.	**No**

EDAPTS Specification		Implemented and Verified
6.5.6.1	The ATRMS consoles shall have the capability to receive vehicle emergency alarms, track vehicles with alarms, and log actions taken.	Yes
6.5.6.2	The ATMS consoles shall have the capability to guide users through the process of creating an emergency plan for handling driver's emergency alarms. This plan shall include procedures for interacting with local law enforcement and forms for developing an emergency callout list.	No
6.5.7.1	The ATRMS shall sound an audio alarm of at least the specified volume at 1 meter.	No
6.5.7.2	The ATRMS shall have a visual emergency indicator that flashes and attracts the attention of any employee within the room the ATRMS is installed in.	No
6.6.9.1	The ATRMS consoles shall have the capability to allow the user to administer each Dynamic Roadside Information Display in the system, including downloading schedules and executables, operational status, and tracking file versions on each sign.	No
6.8.15.1	Time estimates on the ATRMS display shall be accurate to within 30 seconds.	Yes
6.11.22.1	Time estimates in reports generated by the ATRMS shall be accurate to within 30 seconds.	Yes
7.2.1.1	If utilizing TCP/IP communication, ATRMS clients shall function from within a Network Address Translation (NAT) network.	Yes
7.1.1.1	Minimum period of autonomous operation required to support emergency functionality in the event of a power loss should be 1 hour.	n/a
7.3.2.1	The ATRMS Communications System shall meet or exceed a 99.99% successful delivery percentage rate for all data transported between the ATRMS and the ATRMS API.	Yes
7.3.2.2	Maximum time for a message and response between the ATRMS and the CSS should be 30 seconds.	Yes
3. Vendor Certification		
3.1 General Requirements		
1.1.7.6	All EDAPTS elements shall be able to recover from a power loss and resume normal operations without requiring specialized technical interaction.	Yes
1.1.2.1	The minimum number of vehicles supported by the system shall be the eight plus 50%.	Yes
1.1.2.2	The minimum number of Dynamic Roadside Information Displays supported by the system shall be the four plus 50%.	Yes

EDAPTS Specification		Implemented and Verified
1.1.2.3	The minimum number of scheduled runs supported by the system shall be the twelve plus 50%.	**Yes**
1.1.2.4	The minimum number of scheduled routes supported by the system shall be the three plus 50%.	**Yes**
1.1.2.5	The minimum number of scheduled trips supported by the system shall be the 225 plus 50%.	**Yes**
1.1.2.6	The minimum number of stops supported by the system shall be the 33 plus 50%.	**Yes**
1.1.2.7	The minimum number of drivers supported by the system shall be the 30 plus 50%.	**Yes**
1.1.5.5	All system elements and their associated parts shall have a reasonable expectation of being available for a minimum period of five years.	**Yes**
1.1.5.6	All external metal parts and exposed fasteners shall be corrosion resistant.	**Yes**
1.1.6.2	Driver's identification numbers or strings containing sensitive personal information such as social security numbers shall not be stored anywhere in the EDAPTS system or transmitted across any EDAPTS communications link.	**Yes**
1.1.6.3	All EDAPTS components utilizing a TCP/IP connection for communication shall be resistant to compromise by common network attacks such as spoofing and packet flooding (DDOS).	**Yes**
1.1.6.4	ALL EDAPTS components utilizing a wireless communications link shall encode, encrypt, or otherwise protect communications against snooping or unauthorized use. Such protection shall meet or exceed common industry best practices.	**Yes**
1.1.7.1	The expected lifecycle of EDAPTS system elements shall exceed seven years.	**No**
1.1.7.3	All EDAPTS elements installed in an outdoor environment shall be weather resistant to the installed environment.	**Yes**
1.1.7.5	On-Board System elements shall maintain configuration and calibration information in memory for a minimum of 180 days while powered off.	**Yes**
1.1.7.7	All outdoor or vehicle-installed EDAPTS elements shall operate in ambient temperatures up to the specified maximum of 120 degrees Farenheit.	**Yes**
1.1.7.8	All outdoor or vehicle-installed EDAPTS elements shall operate in induced temperatures (include allowances for the effects of solar heating) up to the specified maximum of 160 degrees Farenheit.	**Yes**
1.1.7.9	All outdoor or vehicle installed EDAPTS elements shall operate in temperatures down to the specified minimum of -24 degrees Farenheit.	**Yes**

EDAPTS Specification		Implemented and Verified
1.1.7.10	All outdoor or vehicle-installed EDAPTS elements shall operate at relative humidity levels up to the specified maximum of 100 percent humidity.	**No**
1.1.7.11	All outdoor or vehicle-installed EDAPTS elements shall protect against external contaminants such as dust, salt air, and fog as necessary to prevent interruption of operation.	**Yes**
1.1.8.9	All data transferred between subsystems or components shall be left in an uncompressed, unencoded, or unencrypted form, except as needed for reasons such as security or passage through low-throughput communications links. In instances where compression, encoding, or encryption is deemed necessary, documention shall be provided describing the compression / encoding / encryption algorithms required and fully detailing the implementation used.	**Yes**
1.1.8.10	All transferred data between elements or components shall be validated upon receipt and before use to eliminate out-of-range and non-sensical values.	**Yes**
1.1.8.11	All transferred data between EDAPTS Components shall include a checksum or other similar method to test for data corruption, and shall be tested for such corruption upon receipt.	**Yes**
6.1.5.1	If any time measurement is utilized, it shall be synchronized with Coordinated Universal Time (UTC), and maintain accuracy within the specified limit.	**Yes**
1.1.2.8	The minimum number of passenger farecards supported by the system shall be 50,000 plus 50%.	**n/a**
1.1.7.4	All EDAPTS elements shall be resistant to corruption of data due to power loss, shock, or other external forces.	**Yes**
1.1.7.12	All EDAPTS elements shall operate for a minimum of seven years before expected replacement.	**No**
3.2 On-Board Requirements		
2.1.5.1	On-Board System elements shall be resistant to levels of EMI present in a commercial environment.	**Yes**
2.1.5.2	The expected MTBF of On-Board system elements shall exceed 7,500 hours.	**Yes**
2.1.5.3	On-Board System elements shall not be negatively affected by physical shocks and impacts present in a commercial transit	**Yes**
2.1.5.4	On-Board System elements shall not be negatively affected by the vibrations in a commercial transit environment.	**Yes**
2.1.5.5	On-Board System elements shall be resistant to external contaminants such as dust, salt air, and fog to prevent	**Yes**

EDAPTS Specification		Implemented and Verified
2.2.2.2	The MDT shall have sufficient memory capacity to handle transit system operatonal parameters as given in this specification.	**Yes**
2.2.2.3	The MDT shall have necessary non-volatile storage capacity to sustain operations with all necessary transit system operation parameter maximums as given in this specification.	**Yes**
2.2.2.4	The MDT shall have the necessary non-volitile storage capacity to store all collected stop data for a mimimum of 30 days.	**Yes**
2.2.2.7	The Mobile Data Terminal shall be capable of logging and forwarding to the central site 50 APC counts per minute.	**Yes**
2.2.2.8	The Mobile Data Terminal shall be capable of detecting an emergency actuator signal from the driver and transmitting the message to the central dispatch site within the specified number of seconds.	**Yes**
2.2.3.1	The MDT shall support additional on-board APTS applications in software and hardware.	**Yes**
2.2.3.2	Future modifications to the OBS API shall be possible and shall not affect existing functionality.	**No**
2.2.4.9	The MDT shall have the capability to control an on-board annunciator to notify passengers upon arrival at a stop, departure from a stop, and when travelling between stops.	**Yes**
2.2.4.10	The MDT shall have the capability to control an on-board electronic sign to notify passengers upon arrival at a stop, departure from a stop, and when travelling between stops.	**Yes**
2.2.6.2	Voltage ranges the device must be able to operate under shall be 9 to 32 VDC.	**No**
2.2.6.3	The Mobile Data Terminal shall conform to the SAE J1455 standard, section 4.11.2 for transients and noise ranges the device must be able to operate under.	**Yes**
2.2.9.1	Latitude and longitude estimates shall be accurate to within ten meters.	**Yes**
2.3.10.1	The MDT functional processes shall transfer data to and from the MDT Vehicle Wireless Data Communications System Driver in accordance with the EDAPTS Data Formatting Standard.	**No**
2.4.12.1	The MDT Vehicle Wireless Data Communications System Driver shall receive data from the MDT Functional Processes in accordance with the EDAPTS Data Formatting Standard. Any MDT Vehicle Wireless Data Communications System Driver internal data formatting and compression methods used shall be documented and provided to the transit property.	**No**

EDAPTS Specification		Implemented and Verified
2.6.15.1	For its wired electrical control/data interfaces, the Emergency Actuator shall be able to connect to the MDT, or other onboard peripherals and other equipment. Signal levels shall be compatible with MDT signal input specifications. Signal structure (protocol, timing, etc.) shall be compatible with MDT signal structure needs.	**Yes**
2.6.18.1	The Emergency Actuator's control/data signal interface to the MDT shall be resistant to noise generated in a production bus environment.	**Yes**
3.1.4.1	Shall be resistant to levels of EMI present in a commercial environment.	**Yes**
3.1.4.2	The OBS communication system shall have an expected mean time between failures of 15,000 hours.	**Yes**
3.1.4.3	The OBS communications system shall have an acceptable level of minimum uptime / maximum downtime in a normal operating environment of 99.9 percent.	**Yes**
3.2.1.1	On-Board Wireless Communications elements shall not be negatively affected by physical shocks and impacts present in a commercial transit environment.	**Yes**
3.2.1.2	On-Board Wireless Communications elements shall not be negatively affected by the vibrations in a commercial transit environment.	**Yes**
3.2.2.1	All On-Board Systems Wireless Communications elements shall meet all applicable state and federal DOT standards.	**Yes**
2.2.1.1	For its wired electrical control/data interfaces, the MDT shall be able to connect to other on-board peripherals and other equipment using easy to remove connectors or terminals. The MDT control/data signal interfaces shall be interference tolerant in a production bus environment. Control/data interface signal levels shall be fully defined, non-proprietary and easily accessible to other connecting on-board peripherals and equipment. Control/data signal interfaces shall utilize commonly accepted standards and protocols such as SAE 1708, RS232, TCIP, IEEE, etc. Signal structures used (levels, timing, etc.) shall be compatible with data needs.	**Yes**
2.2.2.5	The Central Site Software shall have the necessary nonvolitile storage capacity to store all collected data for a minimum of one year.	**Yes**
2.2.2.6	The Mobile Data Terminal shall be capable of validating, logging, and forwarding to the central site 50 pass-card media reads per minute.	**n/a**
2.2.4.8	The MDT shall have the capability to receive data from yet to be determined on-board devices, associate this data with stops, and transmit it to the central site upon departure from a stop.	**Yes**

EDAPTS Specification		Implemented and Verified
2.2.6.1	The maximum power dissipation allowable by the onboard devices shall be 30 watts.	**Yes**
3.3 Roadside Requirements		
4.2.5.2	The Roadside Information Display shall have a minimum of 14 days of solar autonomy if no external power source is part of the system. Any internal batteries shall not be discharged below 50% capacity in order to reach this autonomy.	**No**
4.2.5.3	If no external power source is part of the system, the Roadside Information Display shall recover from a 50% discharge level to a 90% charge level within the specified maximum number of days of normal solar operation.	**No**
4.1.3.1	Roadside elements shall be resistant to levels of EMI present in a commercial environment.	**Yes**
4.1.3.2	Roadside elements shall have an expeted mean time between failures of at least 7,500 hours.	**Yes**
4.1.3.3	Shall be resistant to displacement or damage by vandalism.	**Yes**
4.2.1.1	The RID shall take a maximum of 1 second to calculate and make available a received update message for display.	**Yes**
4.2.1.2	The Roadside Information Display shall have the necessary memory capacity to handle transit system operational parameter maximums as given in this specification.	**Yes**
4.2.1.3	The Roadside Information Display shall have the necessary non-volitile storage capacity to sustain operations with all necessary transit system operation parameter maximums as given in this specification.	**Yes**
4.2.2.1	Future modifications to the RID API shall be possible and shall not affect existing functionality.	**No**
4.2.5.1	Roadside elements must be able to operate within the voltage range of 110-125 VAC if powered by direct current.	**Yes**
4.2.5.4	All roadside element power connections shall be fused or breakered at the source connection.	**Yes**
4.3.8.1	Roadside Information Display post shall meet applicable state and federal DOT standards for crash safety.	**Yes**
4.4.9.1	Roadside Information Display foundations and posts shall comply with the Uniform Building Code with regard to wind resistance.	**Yes**
4.4.9.2	Roadside Information Display foundations and posts shall be earthquaqe resistant when installed in earthquake-prone areas.	**Yes**

EDAPTS Specification		Implemented and Verified
4.5.10.1	The RID functional processes shall transfer data to the RID Data Communications System Driver in accordance with the EDAPTS Data Formatting Standard.	**No**
4.5.10.2	The RID functional processes shall transfer data to and from the RID Communications System Driver in accordance with the EDAPTS Data Formatting Standard.	**No**
4.6.11.1	The RID Communications System Driver shall receive data from the RID Functional Processes in accordance with the EDAPTS Data Formatting Standard. Any RID Communications System Driver internal data formatting and compression methods used shall be documented and provided to the transit property.	**No**
4.6.11.2	The RID Data Communications System Driver shall receive data from the RID Functional Processes in accordance with the EDAPTS Data Formatting Standard. Any RID Data Communications System Driver internal data formatting and compression methods used shall be documented and provided to the transit property.	**No**
5.1.3.1	Roadside communications equipment shall be resistant to levels of EMI present in a commercial environment.	**Yes**
5.1.3.2	Roadside communications equipment shall have an expected mean time between failure of 15,000 hours	**Yes**
5.1.3.3	Roadside communications equipment shall have a minimum uptime of 99.9 percent.	**Yes**
3.4 Central Software Requirements		
6.1.2.1.	The Central software shall be capable of supporting at least five spontaneously running ATRMS clients.	**Yes**
8.1.1.1.	The maximum amount of time the Central Site Software shall take to respond to user or system-driven input for vehicle tracking operations shall be one second.	**Yes**
8.1.1.2.	The central Site Software shall have the necessary memory capacity to handle transit system operational parameter maximums as given specifications, and the requried number of field	**Yes**
8.1.1.3.	The Central Site Software shall have the necessary non-volatile storage capacity to sustain operations with all necessary transit system operation parameter maximums as given in this specification.	**Yes**
8.1.2.1.	The central site software shall have a data store for all system configuration, schedule, and collected data.	**Yes**
8.1.4.1.	Minimum period of autonomous operation required to support emergency functionality in the event of a power loss shall be one hour.	**Yes**

EDAPTS Specification		Implemented and Verified
8.1.5.1.	Acceptable levels of minimum uptime / maximum downtime in a normal operating environment shall be 99.99 percent.	**Yes**
8.1.6.1.	If any time measurement is utilized, it shall be synchronized with Coordinated Universal Time (UTC), and maintain accuracy within the specified limit shall be one second.	**Yes**
8.2.1.1.	The central site software shall have an interface to the onboard systems wireless data communications system.	**Yes**
8.2.2.1.	The CSS On-Board Systems API shall transfer from the CSS Vehicle Wireless Data Communications Driver in accordance with the EDAPTS Data Formatting Standard.	**No**
8.3.3.1.	Future modifications to the ATRMS API shall be possible shall not affect existing functionality.	**No**
8.3.4.1.	The central site software shall have the capability to provide system data to other system functions via electronic computer calls over a network.	**Yes**
8.3.5.1	ATRMS API shall transfer data to and from all ATRMS displays in accordance with the EDAPTS Data Formatting Standard.	**No**
8.4.6.1.	Direct, unfiltered, read-only access shall be provided to the data store.	**No**
8.4.7.1	The open data-storage-facility documentation shall be comprehensive and cover all aspects of the data-store including providing a complete data-dictionary, table definitions and relationships as necessary, and all data structure information necessary to query the data-store from an external interface.	**No**
8.4.8.1.	The capacity datastore required to store all entered and recorded data for a minimum of sixty months before expungment or other such maintenance is required.	**No**
8.4.8.2.	The minimum allowable intervals between backups of the data store shall be seven days.	**Yes**
8.4.8.3.	The data storage facility shall have the capability to export data in whole or in part for given ranges, to be used for other functions.	**Yes**
8.4.8.4.	The data storage facility shall have the capability to expunge all entered or recorded data for a given date range.	**Yes**
8.4.8.5.	The data storage facility shall have the capability to back up or archive all entered and recorded data in whole or in part (given data range). Mechanisms shall be available for both user-initiated and scheduled automatic backups.	**Yes**
9.2.1.1.	The data format Stop-Point List shall be formatted in accordance with the EDAPTS Data Formatting Standard.	**No**

EDAPTS Specification		Implemented and Verified
9.3.3.1.	The date format timetable shall be formatted in accordance with the EDAPTS Data Formatting Standard.	No
9.4.4.1.	The data format Work/Runs List shall be formatted in accordance with the EDAPTS Data Formatting Standard.	No
3.5 Client Software Requirements		
6.1.1.2.	The ATRMS shall have the necessary memory capacity to handle transit system operational parameter maximums as given in this specification.	Yes
6.2.2.1.	The On-Board Equipment Administration Controls shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.3.4.1.	The Schedule Management & Administration Tools & Controls shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.4.5.1.	The Driver Management Controls shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.5.8.1.	The Emergency Management Display shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.6.10.1	The Roadside Information Display Controls shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.7.12.1.	The Vehicle Tracking Display shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.8.14.1.	The Schedule Adherence Display shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.9.17.1.	The Passenger Boarding Display shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.10.19.1.	The Ridership Statistics Reporting Controls shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.11.21.1.	The Schedule Adherence Statistics Reporting Controls shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
6.12.24.1.	The System User Management Controls shall transfer data to and from the ATRMS API in accordance with the EDAPTS Data Formatting Standard.	No
8.6.13.1.	The CSS RID API shall receive data from the CSS RID Data Communications System Driver in accordance with the EDAPTS Data Formatting Standard.	No
8.7.14.1.	The CSS RID Communications System Driver shall transfer data to the CSS Roadside Display API in accordance with the EDAPTS Data Formatting Standard. Any CSS RID Communications System Driver internal data formatting and compression methods used over the communications link shall be documented and provided to the transit property.	No

EDAPTS Specification		Implemented and Verified
8.8.15.1.	Future modifications to the Traveler Information API shall be possible shall not affect existing functionality.	No
8.8.16.1.	The central site software shall have the capability to provide system data to outside system functions via electronic computer calls over a network.	Yes
8.8.17.1	The Traveler Information API shall transfer data to and from all external traveler information using entities in accordance with the EDAPTS Data Formatting Standard.	No
7.1.2.1.	Expected mean time between (MTBF) for the ATRMS Comm shall be 15,000 hours.	Yes
7.1.2.2.	Acceptable levels of minimum uptime / maximum downtime in a normal operating environment shall be 99.9 percent.	Yes
4. VENDOR-PROVIDED LICENSING & CERTIFICATION		
4.1 General Requirements		
1.1.5.7	All installed parts of emi transmission shall meet FCC guidelines and licensing as appropriate and shall meet MIL-STD-461 tolerances for radiated emissions.	No
4.2 On-Board Requirements		
2.1.6.1.	All On-Board Systems elements shall meet all applicable state and federal DOT standards.	Yes
2.1.6.2.	All On-Board Systems elements utilizing wireless transmission for inter-element data transfer shall be provided with necessary FC C licenses for operation in the transit system.	Yes
2.1.6.3.	All On-Board Systems elements shall be compliant with the California Electronic Waste Recycling Act of 2003.	Yes
3.1.5.1.	All On-Board Systems Wireless Communications elements shall be provided with necessary FCC licenses for operation in the transit system.	Yes
3.1.5.2.	All On-Board Systems Wireless Communications elements shall be compliant with the California Electronic Waste Recycling Act of 2003.	Yes
4.3 Roadside Requirements		
4.1.4.1	All Roadside Information Display elements shall be provided with necessary FCC licenses for operation in the transit system.	Yes
4.1.4.2	Roadside Information Display elements shall be compliant with the California Electronic Waste Recycling Act of 2003.	Yes
4.2.4.1	The Roadside Information display shall be conformant to ADA Standards for Accessible Design, 28 CFR Part 36.	Yes
4.2.6.1	The Roadside Information Display shall be listed with Underwriters Laboratories if externally AC powered.	Yes

EDAPTS Specification		Implemented and Verified
5.1.4.1	All Roadside Information Display Wireless Communications elements shall be provided with necessary FCC licenses for operation in the transit.	**Yes**
5.1.4.2	All Roadside Information Display Wireless Communications elements shall be compliant with the California Electronic Waste Recycling Act of 2003.	**Yes**

1.1.1	document_writing_level
EDAPTS Specification Identifier	**1.1.1.1**
Metric Requirement	**All documents shall be presented clearly and concisely, and reflect writing of at least a 12th grade level.**
Verification Method	**Verify writing level.**

Verification Procedure	Review sampling of documentation from Syncromatics
Implementation:	INSPECTED DOCUMENTS PROVIDED BY SYNCROMATICS
Comments:	DOCUMENTION IS MINIMAL. ONLY HAVE THE WEB INTERFACE FOR EVALUATION → NO MANUALS PROVIDED. UPDATE 3/5/9: SYNCROMATICS PROVIDED MANUALS
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/17/09

1.1.2	document_reading_ comprehension_level
EDAPTS Specification Identifier	1.1.1.2
Metric Requirement	All documents shall be clearly understandable by audiences with 12th grade reading comprehension level.
Verification Method	Inspect deliverable documents to ensure compliance.

Verification Procedure	Review sampling of documentation from Syncromatics

Implementation:

INSPECTED DOCUMENTS PROVIDED.

Comments:

MINIMAL DOCUMENTATION, ONLY WEB INTERFACE, NO USER MANUALS.

UPDATE: SYNCROMATICS PROVIDED MANUALS 3/5/9

Verification Requirements Met	YES ☒	NO ☐

Signature:	Date:
	2/17/09

1.1.3	document_clarity
EDAPTS Specification Identifier	**1.1.1.3**
Metric Requirement	**All documents shall conform to the MIL-STD-962D documentation standard, section 4.7 for clarity.**
Verification Method	**Verify conformance with standard.**

Verification Procedure	Review sampling of documentation from Syncromatics
Implementation:	INSPECTED DOCUMENTATION.
Comments:	ONLY HAVE WEB-INTERFACE, NO USER MANUALS. ALL TEXT WRITTEN IN CLEAR AND SIMPLE LANGUAGE. SENTANCES IN ACCORDANCE WITH THE RULES OF GRAMMAR.
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/12/09

1.1.4	document_style
EDAPTS Specification Identifier	1.1.1.4
Metric Requirement	All documents shall conform to the U.S. Government Printing Office Style Manual for style and grammar.
Verification Method	Verify conformance with standard.

Verification Procedure	Review sampling of documentation from Syncromatics

Implementation:

INSPECTED DOCUMENTATION.

Comments:

ONLY WEB-INTERFACE AVAILABLE, NO USER MANUALS. APPEARS TO CONFORM TO LEADERWORK AND TABULAR SPECIFICATIONS. FOLLOWS RULES OF PUNCTUATION.

USER MANUALS PROVIDED 3/5/9.

Verification Requirements Met	YES ☒	NO ☐

Signature:	Date:
[signature]	2/12/09

1.1.5	document_wiring_diagrams_identifiers
EDAPTS Specification Identifier	1.1.1.5
Metric Requirement	All cables and wires on wiring diagrams shall utilize unique identifiers which match physical labels on cables.
Verification Method	Inspect deliverables to ensure compliance.

Verification Procedure	Review provided component-level diagrams from Syncromatics

Implementation:

Reviewed provided documentation

Comments:

NO WIRING DIAGRAMS PROVIDED.

UPDATE 3/5/9: SYNCROMETICS HAS PROVIDE SIMPLE WIRING DIAGRAMS WITH THE USER MANUALS, BUT MANY CABLES ARE UNLABELED OR DO NOT MATCH DIAGRAMS.

Verification Requirements Met	YES ☐ NO ☒

Signature:	Date: 2/17/09

1.1.6	document_wiring_diagrams_inter_page_connections
EDAPTS Specification Identifier	1.1.1.6
Metric Requirement	All wiring diagram inter-page connections shall be clearly marked at the left or right hand side of the page with the wire or cable's unique identifier.
Verification Method	Inspect deliverables to ensure compliance.

Verification Procedure	Review provided diagrams from Syncromatics
Implementation:	REVIEWED PROVIDED DOCUMENTATION
Comments:	NO WIRING DIAGRAMS PROVIDED. UPDATE 3/5/9: SYNCROMATICS HAS PROVIDED WIRING DIAGRAMS, BUT NONE CROSS PAGE BOUNDARIES.
Verification Requirements Met	YES ☐ NO ☒ N/A
Signature:	Date: 2/17/09

1.1.7	system_manual_theory
EDAPTS Specification Identifier	**1.1.1.9**
Metric Requirement	**The System Manual shall include a Theory of Operation outlining the operation of the system and how it functions.**
Verification Method	**Verify conformance with standard.**

Verification Procedure	Review provided manual from Syncromatics to ensure inclusion.

Implementation:

Comments:

NO SYSTEM MANUAL PROVIDED.

UPDATE 3/5/9: USER MANUALS PROVIDED, BUT NO SYSTEM MANUAL.

Verification Requirements Met	**YES** ☐	**NO** ☒
Signature:		**Date:** 2/12/09

1.1.23	system_manual_ comprehensiveness
EDAPTS Specification Identifier	**1.1.1.10**
Metric Requirement	**The System Manual shall be comprehensive and cover all system-operation scenarios in clear step-by-step detail.**
Verification Method	**Verify document comprehensiveness.**

Verification Procedure	Review provided manual from Syncromatics to ensure completeness.
Implementation:	
Comments: NO SYSTEM MANUAL PROVIDED.	
Verification Requirements Met	**YES** ☐ **NO** ☒
Signature:	**Date:** 2/17/09

1.1.8	system_manual_troubleshooting
EDAPTS Specification Identifier	1.1.1.11
Metric Requirement	The System Manual shall include clear step-by-step instructions for troubleshooting any potential system problems.
Verification Method	Verify troubleshooting procedures and completeness.

Verification Procedure	Review provided manual from Syncromatics to ensure inclusion.
Implementation:	
Comments: NO SYSTEM MANUAL PROVIDED.	
Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 2/12/09

1.1.9	system_manual_ installation_ documentation
EDAPTS Specification Identifier	1.1.1.12
Metric Requirement	The System Manual shall include clear step-by-step instructions for installing the EDAPTS system.
Verification Method	Verify troubleshooting procedures and completeness.

Verification Procedure	Review provided manual from Syncromatics to ensure inclusion.

Implementation:

REVIEWED PROVIDED DOCUMENTATION.

Comments:

NO SYSTEM MANUAL PROVIDED.

UPDATE 3/5/9: SYNCROMATICS PROVIDED USER MANUALS WITH INSTALLATION INSTRUCTIONS. INSTRUCTIONS ARE NOT COMPREHENSIVE, DO NOT COVER MOUNTING OF HARDWARE, AND DO NOT INCLUDE STEP-BY-STEP INSTRUCTIONS.

Verification Requirements Met	YES ☐ NO ☑

Signature:	Date: 2/17/09

1.1.10	system_manual_ maintenance_ instructions
EDAPTS Specification Identifier	**1.1.1.13**
Metric Requirement	**The System Manual shall include clear step-by-step instructions for all necessary routine or scheduled maintenance procedures.**
Verification Method	**Verify troubleshooting procedures and completeness.**

Verification Procedure	Review provided manual from Syncromatics to ensure inclusion.
Implementation: REVIEWED PROVIDED DOCUMENTATION.	
Comments: NO SYSTEM MANUAL PROVIDED. UPDATE: SYNCROMATICS PROVIDED USER MANUALS, BUT NO SYSTEM MANUAL. USER MANUALS DO NOT INCLUDE MAINTENANCE INSTRUCTIONS.	
Verification Requirements Met	YES ☐ NO ☒
Signature: [signature]	**Date:** 2/17/09

1.1.11	operator_manual_ comprehensiveness
EDAPTS Specification Identifier	**1.1.1.14**
Metric Requirement	**The User Manual shall be comprehensive and cover all user-operation scenarios in clear step-by-step detail.**
Verification Method	**Verify document comprehensiveness.**

Verification Procedure	Review provided manual from Syncromatics to ensure inclusion.
Implementation:	
Comments:	NO OPERATOR MANUAL PROVIDED. OPERATOR DOCUMENTATION ON DEVICES AND WEB-INTERFACE ARE MINIMAL. UPDATE: 3/3/9 — OPERATOR MANUAL PROVIDED. USER INSTRUCTIONS COMPREHENSIVE IN WEBSITE MANUAL. NO USER INSTRUCTIONS IN MDT MANUAL.
Verification Requirements Met	YES ☒ NO ☒
Signature:	**Date:** 2/12/09

1.1.12	operator_manual_ troubleshooting
EDAPTS Specification Identifier	**1.1.1.15**
Metric Requirement	**The User Manual shall include clear step-by-step instructions for troubleshooting common potential problems.**
Verification Method	**Verify troubleshooting procedures and completeness.**

Verification Procedure	Review provided manual from Syncromatics to ensure inclusion.
Implementation:	
Comments: NO OPERATOR MANUAL PROVIDED. NO TROUBLESHOOTING PROVIDED ON DEVICES. UPDATE: 3/5/9 — SYNCROMATICS PROVIDED USER MANUALS, TROUBLESHOOTING PROVIDED ONLY IN THE APC MANUAL	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 2/12/09

1.1.11	ease_of_use_ALL
EDAPTS Specification Identifier	**1.1.3.1**
Metric Requirement	**All devices displaying information to or requiring information from a user shall be easy to use and display clear operational usage instructions to the user**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts.
Implementation:	REVIEWED PROPOSAL. INSPECTED ON-BOARD HARDWARE AND WEB INTERFACE.
Comments:	ON-BOARD MAT AND WEB INTERFACE EASY TO USE WITH CLEAR OPERATIONAL INSTRUCTIONS.
Verification Requirements Met	YES ☒ NO ☐
Signature: NAB	**Date:** 2/17/09

1.1.12	part_interchangability
EDAPTS Specification Identifier	**1.1.5.4**
Metric Requirement	**All parts having the same manufacturer's part number are functionally and physically interchangeable.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts.

Implementation:

INSPECTED BUSES 194 & 198, THREE OF THE FOUR SIGNS.

Comments:

LESS APPLICABLE IN A SERVICE-BASED MODEL, BUT RELAVENT TO SIGNS AS THE POSTS AND MOUNTS NOT INSTALLED BY SYNCROMATICS

Verification Requirements Met	**YES** ☑	**NO** ☐
Signature:	**Date:**	
	2/12/9	

1.1.13	part_edge_trueness
EDAPTS Specification Identifier	**1.1.5.1**
Metric Requirement	**Any non-radiused external part edges shall be smooth, straight, and true.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts.
Implementation:	INSPECTED BUSES 198 & 199, THREE OF FOUR TRANSIT SIGNS
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/17/09

1.1.14	part_corners
EDAPTS Specification Identifier	1.1.5.2
Metric Requirement	All installed physical parts shall have smoothed (radiused / non-sharp) corners.
Verification Method	Verify in system design document or specifications. Inspect deliverables to ensure compliance.

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts.
Implementation: INSPECTED BUSES 198-199.	
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/17/9

1.1.15	part_physical_tolerances
EDAPTS Specification Identifier	**1.1.5.3**
Metric Requirement	**All physical parts shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.
Implementation:	INSPECTED BUSES 198 & 199, AND ~~THREE~~ OF FOUR SIGNS.
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/17/9

1.1.16	abrasion_resistance_OBS
EDAPTS Specification Identifier	1.1.5.8
Metric Requirement	All installed cables shall utilize cable clamps, split loom, cable raceways, or other similar methods to minimize cable abrasion along the length of the cable.
Verification Method	Inspect deliverables to ensure compliance.

Verification Procedure	Inspect 20% random sampling of unit installations to ensure conformance.

Implementation:

INSPECTED BUSES 198 + 199.

Comments:

WHILE SOME CABLE RUNS USE ANTI-CABLE ABRASION METHODS, NOT ALL RUN THE ENTIRE LENGTH OF THE CABLE. SOME CABLES ARE UNPROTECTED, INCLUDING INDIVIDUAL CONDUCTORS.

Verification Requirements Met	YES ☐ NO ☒

Signature:	Date: 2/17/9

1.1.17	product_marking
EDAPTS Specification Identifier	**1.1.8.1**
Metric Requirement	**All installed parts shall bear a manufacturer's nameplate or sticker, containing the manufacturer's name, product part number and revision as applicable, and serial number.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Inspect 20% random sampling of component-level parts to ensure conformance.

Implementation:

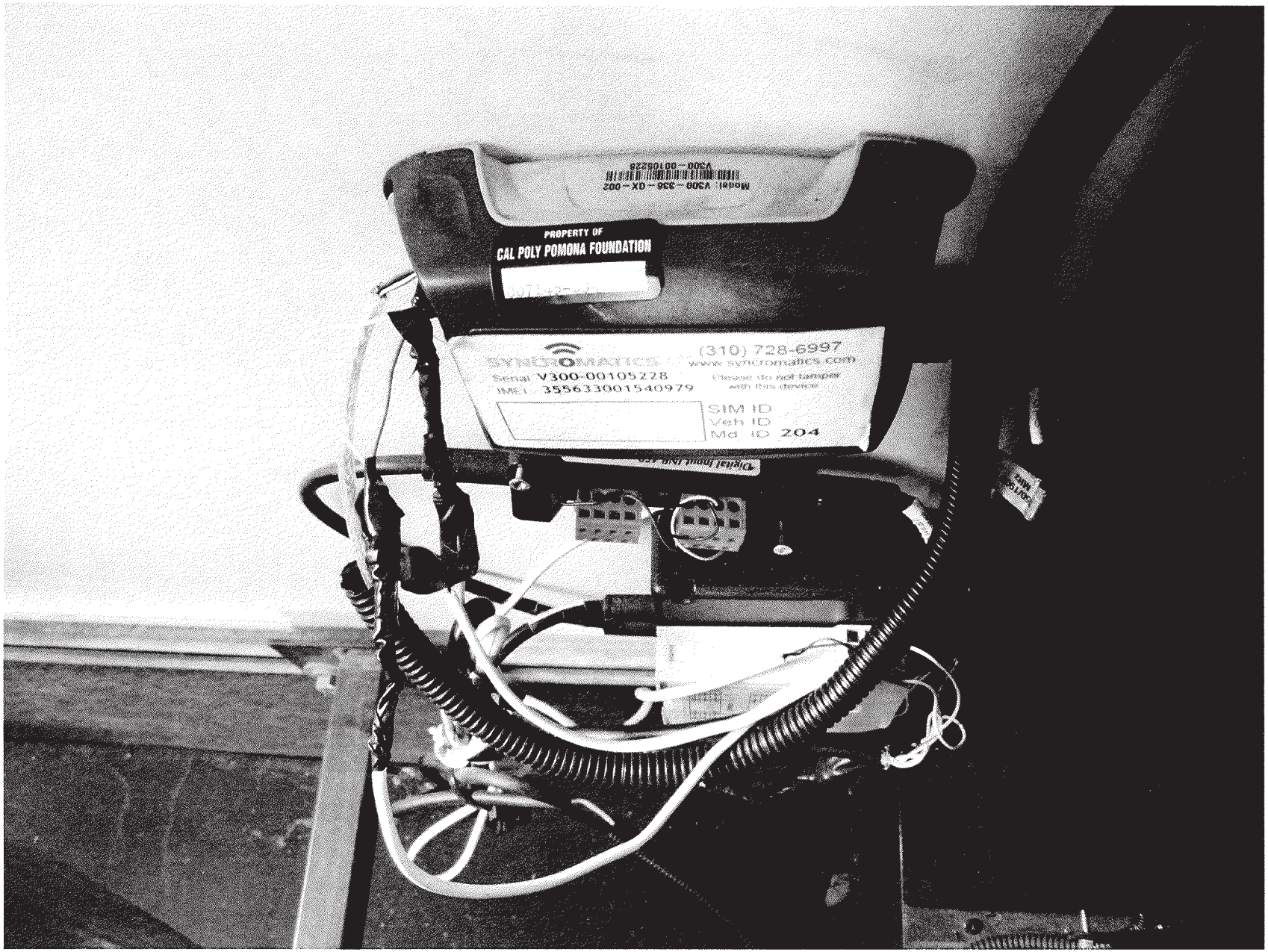
INSPECT HARDWARE ON 1988-199.

Comments:

VLV IS THE ONLY COMPONENT TO BEAR A VENDOR NAMEPLATE.

Verification Requirements Met	**YES** ☐ **NO** ☒

Signature:	**Date:**
	2/7/9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1.1.18	cable_standards
EDAPTS Specification Identifier	**1.1.8.2**
Metric Requirement	**All field-installed interface wires and cables shall use suitable guage, shielding, and color for the application in conformance with applicable SAE and state and federal DOT standards.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Inspect 20% random sampling of unit installation cabling to ensure conformance.
Implementation: INSPECTED CABLING, CONFIRMED WITH SYNCROMATICS.	
Comments: SYNCROMATICS CERTIFYS THAT ALL INTERCONNECTS MEET STANDARDS.	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 3/5/19

1.1.19	cable_marking
EDAPTS Specification Identifier	**1.1.8.3**
Metric Requirement	**All installed interconnect cables shall bear a cable marker at six inches from each end of the cable, and at regular intervals along the cable.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Inspect 20% random sampling of unit installation cabling to ensure conformance.
Implementation: INSPECTED VEHICLES 198 & 199.	
Comments: MOST CABLES DO NOT BEAR CABLE MARKERS.	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 2/17/09

1.1.20	workmanship
EDAPTS Specification Identifier	1.1.8.5
Metric Requirement	All equipment and accessories shall be a product of good workmanship and shall be free from any defects that will affect their appearance or serviceability.
Verification Method	Inspect deliverables to ensure compliance.

Verification Procedure	Inspect 20% of unit installations to ensure products are free from physical defects.

Implementation:

INSPECTED ON-BOARD HARDWARE AND SIGNS.

Comments:

ALL EQUIPMENT APPEARS TO BE OF GOOD WORKMANSHIP AND FREE FROM DEFECT. ON-BOARD CABLE INTER-CONNECT INSTALLATION IS POOR, BUT CONNECTIONS ARE SOLID.

Verification Requirements Met	YES ☒	NO ☐
Signature: [signature]	Date: 2/17/09	

1.1.21	document_wiring_diagram_individual_signals
EDAPTS Specification Identifier	1.1.1.7
Metric Requirement	All wiring diagrams shall reflect individual signal levels for multi-conductor cables.
Verification Method	Inspect deliverables to ensure compliance.

Verification Procedure	Review provided diagrams from Syncromatics

Implementation:

REVIEWED DOCUMENTATION.

Comments:

AVL MANUAL PROVIDES INDIVIDUAL SIGNAL DETAIL, BUT MDT & VCU MANUALS DO NOT. NO SIGN MANUAL.

Verification Requirements Met	YES ☐ NO ☒

Signature:	Date: 3/5/19

1.1.22	document_wiring_diagrams_standard_connections
EDAPTS Specification Identifier	**1.1.1.8**
Metric Requirement	**System wiring diagrams shall indicate all individual conductors/signals by unique identifier**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review provided diagrams from Syncromatics
Implementation: REVIEWED DOCUMENTATION.	
Comments: MOST CONDUCTORS ON ALL DIAGRAMS DO NOT HAVE A UNIQUE IDENTIFIER.	
Verification Requirements Met	**YES** ☐ **NO** ☒
Signature:	**Date:** 3/5/19

1.1.24	element_part_availability
EDAPTS Specification Identifier	1.1.4.2
Metric Requirement	The transit property shall have the ability to self-maintain all system Elements due to the availability of spare parts and the capability to retain a supply of spares.
Verification Method	Verify in vendor's contract documents.

Verification Procedure	Inspect contract to determine capability.
Implementation: NOT APPLICABLE IN A SERVICE-BASED MODEL	
Comments:	
Verification Requirements Met	YES ☐ NO ☐ N/A
Signature:	Date: 2/17/9

1.1.25	specification_conflicts
EDAPTS Specification Identifier	1.1.8.8
Metric Requirement	In case of conflict between regulatory body, classification and international regulations and requirements, and this specification, the more stringent requirement shall take precedence.
Verification Method	Verify in system design document or specifications.

Verification Procedure	Inspect contract, provided design documents, and specifications.
Implementation: REVIEWED CONTRACT AND DOCUMENTATION PROVIDED BY SYKRONAUTICS.	
Comments: ALL REQUIREMENTS APPEAR TO CONFORM TO THE MORE STRINGENT SPECIFICATION.	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 3/5/19

1.1.26	data_structure_extensibility
EDAPTS Specification Identifier	1.1.8.12
Metric Requirement	If extension of an EDAPTS protocol is deemed necessary, it shall be done in a manner that does not interfere or break compatilbility with existing data elements, and shall not duplicate or otherwise repeat existing functionality.
Verification Method	Verify in system design document or specifications or inspect supplied certifications

Verification Procedure	Inspect system design documentation.
Implementation: REVIEWED DOCUMENTATION PROVIDED BY SYNCROMATICS.	
Comments: SYSTEM DOES NOT IMPLEMENT EDAPT DATA-STANDARD.	
Verification Requirements Met	YES ☐ NO ☒
Signature: [signature]	Date: 3/5/19

1.1.27	software_programming_ languages
EDAPTS Specification Identifier	1.1.8.13
Metric Requirement	All vendor-developed software shall be written in an industry standard, high level, non-proprietary language.
Verification Method	Verify in system design document or specifications or inspect supplied certifications

Verification Procedure	Inspect system design documentation.

Implementation:

REVIEWED DOCUMENTATION PROVIDED BY SYNCROMATICS.

Comments:

ALL SOFTWARE APPEARS TO BE COMPLIANT

Verification Requirements Met	YES ☒ NO ☐

Signature:	Date: 3/5/19

1.1.28	equipment_commonality
EDAPTS Specification Identifier	1.1.8.6
Metric Requirement	All installed equipment shall share Component-level part commonality, allowing for ease of swappage or replacement with minimal reconfiguration.
Verification Method	Verify in system design document or specifications. Inspect deliverables to ensure compliance.

Verification Procedure	Review design documents provided by Syncromatics. Inspect 25% random sampling of installed components to ensure compliance.
Implementation:	REVIEWED DOCUMENTATION. INSPECTED BUS #804-199, 3 OF 4 TRANSIT SIGNS
Comments:	COMPONENT-LEVEL PARTS ALL SHARE COMMONALITY
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/12/09

1.1.29	hardware_commonality
EDAPTS Specification Identifier	**1.1.8.7**
Metric Requirement	**All user or maintenace accessible hardware (including mounting hardware) shall share Component-level part commonality, and also at the system-wide level where possible.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 25% random sampling of installed components to ensure compliance.

Implementation:

REVIEWED DOCUMENTATION. INSPECTED BUS 1986/99, 3 OF 4 TRANSIT SIGNS.

Comments:

HARDWARE ALL APPEARS TO SHARE COMMONALITY.

Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/17/09

1.1.30	element_installability
EDAPTS Specification Identifier	**1.1.4.1**
Metric Requirement	**All system elements shall be installable by qualified transit property personnel.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 25% random sampling of installed components to ensure compliance.

Implementation:

INSPECTED BUS 198 & 199, 3 OF 4 SIGNS.

Comments:

UNABLE TO ACTUALLY TEST INSTALLATIONS, BUT ALL PART INSTALLS APPEAR TO BE ABLE TO BE INSTALLED BY TRAINED PERSONNEL.

Verification Requirements Met	**YES** ☒	**NO** ☐
Signature:		**Date:** 2/17/09

1.2.1	mounting_hole_pattern_ tolerances_OBS
EDAPTS Specification Identifier	**2.1.3.1**
Metric Requirement	**All On-Board System element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.
Implementation: NOT APPLICABLE IN A SERVICE-BASED MODEL.	
Comments: [May not be applicable in a service-based system model]]	
Verification Requirements Met	YES ☐ NO ☐ N/A
Signature:	**Date:**

1.2.2	mounting_hole_size_ tolerances_OBS
EDAPTS Specification Identifier	**2.1.3.2**
Metric Requirement	**All On-Board System element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.

Implementation:

NOT APPLICABLE IN SERVICE-BASED MODEL

Comments:

[May not be applicable in a service-based system model]]

Verification Requirements Met	**YES** ☐	**NO** ☐	N/A

Signature:	**Date:**

1.2.3	over_current_protection_OBS
EDAPTS Specification Identifier	**2.1.4.1**
Metric Requirement	**All power connections shall be fused or circuit breaker protected at the source connection.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of onboard hardware source power connections for each bus type devices are installed on.
Implementation:	
Comments: ASSURED BY SYNCROMATICS THAT ALL CONNECTIONS ARE FUSED. INSPECTED ON-BOARD CONNECTIONS ON 198 & 199 TO CONFIRM.	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/17/9

1.2.4	power_switch_MDT
EDAPTS Specification Identifier	**2.2.4.1**
Metric Requirement	**The MDT shall have an accessible power switch in the driver's compartment.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect installed product.
Implementation: INSPECTED ON-BOARD HARDWARE.	
Comments: THERE IS A BUTTON (F2) TO BOOT MDT, BUT NO WAY TO TURN IT OFF. RESTART FUNCTIONALITY REQUIRES ADMIN PASSWORD (SOFTWARE BASED)	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 2/2/9

1.2.5	process_APC_counts_MDT
EDAPTS Specification Identifier	**2.2.4.7**
Metric Requirement	**The MDT shall receive APC boarding and alighting data from the APC, display a cumulative count to the driver, associate this data with stops during the day, and incorporate the data into the stop record transmitted to the central site for each stop.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling to ensure functionality. Confirm central site reporting of counts.

Implementation:

INSPECTED BUS 198 & 199

Comments:

[This metric should be compared with Validation efforts]

DOES NOT DISPLAY BOADINGS AND ALIGHTINGS TO DRIVER. BELIEVED THAT PROCESSING IS DONE SERVER-SIDE, NOT [redacted] AT MDT.

Verification Requirements Met	**YES** ☒ **NO** ☐

Signature: NGH	**Date:** 2/2/9

1.2.6	interface_documentation_APC_MDT
EDAPTS Specification Identifier	2.5.13.1
Metric Requirement	Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the MDT and the automatic passenger counter shall be provided by the vendor upon delivery.
Verification Method	Inspect documentation deliverables to ensure compliance.

Verification Procedure	Inspect interface requirements document provided by Syncromatics.
Implementation: REVIEWED SYNCROMATICS RESPONSE TO INTERFACE INQUIRY.	
Comments: APC OPERATES ON IBIS PROTOCOL. CABLING INTERCONNECT REQUIREMENTS PROVIDED.	
Verification Requirements Met	YES ☒ NO ☐
Signature: [signature]	Date: 3/5/19

1.2.7	count_passengers_APC
EDAPTS Specification Identifier	**2.5.14.2**
Metric Requirement	**The APC unit shall count boardings and alightings and provide data to the MDT.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling to ensure functionality.

Implementation:

INSPECTED BUSES 198 & 199.

Comments:

[Duplicate verification, see 2.2.4.7] COUNTS ARE TRANSMITTED TO CENTRAL SERVER, BUT NOT RELAYED TO MDT, VIA VLU.

Verification Requirements Met	**YES** ☐ **NO** ☒
Signature: NGH	**Date:** 2/3/9

1.2.8	mounting_hole_pattern_ tolerances_OBS_Comm
EDAPTS Specification Identifier	**3.1.2.1**
Metric Requirement	**All On-Board Communications element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.

Implementation:

NOT APPLICABLE IN A SERVICE-BASED MODEL.

Comments:

[May not be applicable in a service-based system model]] MOUNTING IS THE RESPONSIBILITY OF THE PROVIDER.

Verification Requirements Met	**YES** ☐	**NO** ☐	N/A

Signature:	**Date:**

1.2.9	mounting_hole_size_ tolerances_OBS_Comm
EDAPTS Specification Identifier	**3.1.2.2**
Metric Requirement	**All On-Board Communications element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.

Implementation:

NOT APPLICABLE IN A SERVICE-BASED MODEL.

Comments:

[May not be applicable in a service-based system model]]

Verification Requirements Met	YES ☐ NO ☐ N/A

Signature:	**Date:**

1.2.10	over_current_protection_OBS_Comm
EDAPTS Specification Identifier	**3.1.3.1**
Metric Requirement	**All power connections shall be fused or breakered at the source connection.**
Verification Method	**Verify in system design document or specifications. Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of onboard hardware source power connections for each bus type devices are installed on.
Implementation: INSPECTED 198 & 199. CONFIRMED FUSING WITH SYNCROMATICS.	
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 3/5/19

1.2.11	interface_documentation_MDT_comm_driver
EDAPTS Specification Identifier	**2.4.11.1**
Metric Requirement	**Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the MDT wireless data-communications system driver and the on-board wireless data interface shall be provided by the vendor upon delivery.**
Verification Method	**Inspect documentation deliverables to ensure compliance.**

Verification Procedure	Inspect interface requirements document provided by Syncromatics.

Implementation:

REQUEST DOCUMENTATION OF INTERFACE, NOT RECIEVED.

Comments:

[May not be applicable in a service-based system model]]

Verification Requirements Met	**YES** ☐ **NO** ☒

Signature:	**Date:**
	5/5/19

1.2.12	command_and_control_APC
EDAPTS Specification Identifier	**2.5.14.1**
Metric Requirement	**The APC shall be able to have collected data retrieved remotely**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Use dispatch console to retrieve APC data or inspect ridership reports.

Implementation:

INSPECTED AND USED DISPATCH CONSOLE TO VIEW RIDERSHIP REPORTS

Comments:

Verification Requirements Met	YES ☒ NO ☐
Signature: NCobb	**Date:** 2/2/9

1.2.12	interface_documentation_emergency_actuator_MDT
EDAPTS Specification Identifier	**2.6.16.1**
Metric Requirement	**Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the MDT and the emergency actuator shall be provided by the vendor upon delivery.**
Verification Method	**Inspect documentation deliverables to ensure compliance.**

Verification Procedure	Inspect interface requirements document provided by Syncromatics.
Implementation: REQUESTED INTERFACE DOCUMENTATION. NOT RECIEVED.	
Comments: [May not be applicable in a service-based system model]]	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 3/5/19

1.3.1	mounting_hole_pattern_ tolerances_RID
EDAPTS Specification Identifier	**4.1.2.1**
Metric Requirement	**All Roadside Information Display element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.
Implementation: NOT APPLICABLE — INSPECTED DOCUMENTATION AND 3 OF 4 SIGNS.	
Comments: [Syncromatics signs must mate with CP Pomona posts]	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 3/6/9

1.3.2	mounting_hole_size_ tolerances_RID
EDAPTS Specification Identifier	**4.1.2.2**
Metric Requirement	**All Roadside Information Display element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.

Implementation:

NOT APPLICABLE IN A SERVICE-BASED MODEL

INSPECTED DOCUMENTATION AND 3 OF 4 SIGNS.

Comments:

[Syncromatics signs must mate with CP Pomona posts]

Verification Requirements Met	**YES** ☒ **NO** ☐

Signature: NRC	**Date:** 3/6/19

1.3.3	mounting_hole_pattern_ tolerances_RID_Comm
EDAPTS Specification Identifier	**5.1.2.1**
Metric Requirement	**All Roadside Communications element mounting hole patterns shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.

Implementation:

NOT APPLICABLE

Comments:

[Syncromatics signs must mate with CP Pomona posts]

COMM IS INSIDE SIGN COMPONENT

Verification Requirements Met	**YES** ☐ **NO** ☐	N/A
Signature:	**Date:**	

1.3.4	mounting_hole_size_ tolerances_RID_Comm
EDAPTS Specification Identifier	**5.1.2.2**
Metric Requirement	**All Roadside Communications element mounting hole dimensions shall be manufactured to within the given tolerance of their specified dimensions.**
Verification Method	**Inspect deliverables to ensure compliance.**

Verification Procedure	Review design documents provided by Syncromatics. Inspect 20% random sampling of installed component-level parts to ensure tolerances of 0.005 inches from given design.

Implementation:

NOT APPLICABLE

Comments:

[Syncromatics signs must mate with CP Pomona posts]

COMM IS INSIDE SIGN COMPONENT

Verification Requirements Met	YES ☐	NO ☐
Signature:	**Date:**	

1.3.5	rigidity_RID_Mounting
EDAPTS Specification Identifier	4.3.8.1
Metric Requirement	Roadside Information Display post shall meet applicable state and federal DOT standards for crash safety.
Verification Method	Perform design analysis or inspect supplied certifications.

Verification Procedure	Inspect University-supplied design analysis to ensure conformance with standards.
Implementation: REVIEWED CAP - PROVIDED DOCUMENTATION.	
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature: [signature]	Date: 3/6/19

1.3.6	wind_resistance_RID_Mounting
EDAPTS Specification Identifier	**4.4.9.1**
Metric Requirement	**Roadside Information Display foundations and posts shall comply with the Uniform Building Code with regard to wind resistance.**
Verification Method	**Perform design analysis or inspect supplied certifications.**

Verification Procedure	Inspect University-supplied design analysis to ensure conformance with standards.
Implementation: REVIEWED CPP-PROVIDED DOCUMENTATION.	
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 3/7/9

1.3.7	earthquake_resistance_RID_Mounting
EDAPTS Specification Identifier	4.4.9.2
Metric Requirement	Roadside Information Display foundations and posts shall be earthquaqe resistant when installed in earthquake-prone areas.
Verification Method	Perform design analysis or inspect supplied certifications.

Verification Procedure	Inspect University-supplied design analysis to ensure conformance with standards.
Implementation: REVIEWED CPG-PROVIDED DOCUMENTATION.	
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 3/9/9

1.4.1	self_diagnostics_RID_Comm
EDAPTS Specification Identifier	8.1.3.2
Metric Requirement	The Central Site Software shall provide self-test diagnostics to aid in fault isolation.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Inspect roadside installation.

Implementation:

CHECKED CENTRAL SOFTWARE

Comments:

NO TESTING FUNCTIONALITY FOUND

Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 2/2/09

1.4.2	interface_documentation_CSS_comm_driver
EDAPTS Specification Identifier	8.5.10.1
Metric Requirement	Documentation detailing the complete physical, electrical, and messaging requirements for the interface between the CSS vehicle communications system driver and the central-site wireless data interface shall be provided by the vendor upon delivery.
Verification Method	Inspect documentation deliverables to ensure compliance.

Verification Procedure	Inspect interface requirements document provided by Syncromatics.
Implementation: [redacted] REQUESTED INTERFACE DOCUMENTATION FROM SYNCROMATICS. NOT RECIEVED.	
Comments:	
Verification Requirements Met	YES ☐ NO ☒
Signature: [signature]	Date: 3/7/19

1.5.1	track_transit_fleet_ATRMS
EDAPTS Specification Identifier	6.7.11.1
Metric Requirement	The ATRMS consoles shall have the capability to track transit vehicles via map-based and tabular display.
Verification Method	Verify in system design document or specifications. Inspect deliverables to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Inspect console ensuring complete feature inclusion.

Implementation:

INSPECTED CONSOLE

Comments:

OBSERVED MAP & TABULAR DISPLAYS

Verification Requirements Met	YES ☒	NO ☐
Signature: NGH	Date: 2/2/9	

1.5.2	schedule_adherence_display_ATRMS
EDAPTS Specification Identifier	**6.8.13.1**
Metric Requirement	**The ATRMS consoles shall have the capability to track transit vehicle schedule information and display it to the user.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Inspect console ensuring complete feature inclusion.
Implementation:	INSPECTED CONSOLE AND VIEWED VEHICLE TRACKING NO SCHEDULE ADHERENCE
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/2/9

1.5.3	vehicle_loading_info_ATRMS
EDAPTS Specification Identifier	6.9.16.1
Metric Requirement	The ATRMS consoles shall have the capability to track transit vehicle loading information and display it to the user.
Verification Method	Verify in system design document or specifications. Inspect deliverables to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Inspect console ensuring complete feature inclusion.
Implementation:	INSPECTED CONSOLE AND VIEWED DATA
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/2/9

1.5.4	ridership_reports_ATRMS
EDAPTS Specification Identifier	6.10.18.1
Metric Requirement	The ATRMS consoles shall have the capability to compile and present ridership reports for the user.
Verification Method	Verify in system design document or specifications. Inspect deliverables to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Inspect console ensuring complete feature inclusion.
Implementation: INSPECTED CONSOLE AND GENERATED A REPORT	
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/2/9

1.5.5	schedule_adherence_reports_ATRMS
EDAPTS Specification Identifier	6.11.20.1
Metric Requirement	The ATRMS consoles shall have the capability to compile and present schedule adherence reports for the user.
Verification Method	Verify in system design document or specifications. Inspect deliverables to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Inspect console ensuring complete feature inclusion.
Implementation:	OPERATED CONSOLE AND GENERATED REPORTS. NO SCHEDULE ADHERENCE.
Comments:	
Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 2/2/9

1.5.6	ATRMS_user_admin_ATRMS
EDAPTS Specification Identifier	6.12.23.1
Metric Requirement	The ATRMS consoles shall have the capability to allow the user to administer all system users and their permissions.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Inspect console ensuring complete feature inclusion.
Implementation:	INSPECTED CONSOLE AND OPERATED USER MANAGER
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/2/9

2.1.1	mayday_message_ reliability
EDAPTS Specification Identifier	1.1.7.2
Metric Requirement	Mayday messages initiated by the driver shall be received with the specified percent reliability.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by initiating a mayday message on-board vehicle. Verify reciept of message with dispatch.

Implementation:

TESTED ON 198 AND 199.

Comments:

100% RECIEVED AND VERIFIED

Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/3/9

2.1.2	rider_ID_privacy
EDAPTS Specification Identifier	1.1.6.1
Metric Requirement	Raw passenger fare or pass identification numbers or strings that directly identify a specific rider may not be stored anywhere in the EDAPTS system or transmitted across any EDAPTS communications link. Any obsfucation method of these numbers must be one-way and non-reversible, preventing the transformation back to a raw ID number or string.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Request assistance from Syncromatics in viewing raw transmitted data.
Implementation: NOT APPLICABLE – NO PASS COLLECTION / VALIDATION IN INSTALLATION	
Comments:	
Verification Requirements Met	YES ☐ NO ☐ N/A
Signature:	Date:

2.1.3	null_values
EDAPTS Specification Identifier	1.1.8.4
Metric Requirement	Null values shall be used when initializing or creating any data or data types, or recording an out-of-range value.
Verification Method	Verify in system design document or specifications. Test deliverables to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Request assistance from Syncromatics in viewing raw transmitted data.
Implementation:	INSPECT PROVIDED DOCUMENTATION. REQUESTED CERTIFICATION FROM SYNCROMATICS → NOT ALL DATA IS INITIALIZED TO NULL, BUT MOST OF THEIR STRUCTURES SUPPORT THEM.
Comments:	
Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 3/7/19

2.2.1	inobtrusiveness_OBS
EDAPTS Specification Identifier	2.1.1.1
Metric Requirement	On-board devices shall not impede driver's view of the road, normal driver operations, movement in the driver's or passenger compartments, nor entry or egress from the vehicle.
Verification Method	Test installation to ensure compliance.

Verification Procedure	Test 25% sampling of buses with on-board devices installed. Sit down in driver's position, ensuring that no installed device impairs entry to the compartment. Ensure that no device impedes any driver operations by operating vehicle controls. Ensure no device blocks view of road via front or side windows, and does not occlude vehicle mirrors. Exit driver's position, ensuring no installed device obstructs egress.
Implementation: BUS 198 SAT IN DRIVER'S COMPARTMENT. NO IMPEDANCE OBSERVED	BUS 199 NO IMPEDANCE OBSERVED
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature: NCobb	Date: 2/2/9

2.2.2	removal_and_replacement_OBS
EDAPTS Specification Identifier	**2.1.2.1**
Metric Requirement	**The maximum amount of time required to remove and replace an On-Board system element.**
Verification Method	**Test installation to ensure compliance.**

Verification Procedure	Enlist assistance of Syncromatics and qualified personnel. Time the removal and replacement of onboard MDT, verifying whether or not it meets the 10 minute requirement.

Implementation:

NOT APPLICABLE IN A SERVICE-BASED MODEL. REMOVAL AND REPLACMENT IS THE RESPONSIBILITY OF THE SERVICE PROVIDER.

Comments:

Verification Requirements Met	YES ☐	NO ☐	N/A

Signature:	**Date:** 2/2/09

2.2.3	self_diagnostics_OBS
EDAPTS Specification Identifier	**2.1.2.2**
Metric Requirement	**The On-Board systems shall provided self-test diagnostics to aid in fault isolation.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by enabling self-test diagnostics on the MDT. Document results.

Implementation:

INSPECTED 198 & 199.

Comments:

NEED PASSWORD) NO REAL DIAGNOSTICS. MINIMAL LOGGING IN ADMIN MODE.

Verification Requirements Met	**YES** ☐	**NO** ☒
Signature:		**Date:** 2/2/9

2.2.4	user_input_responsiveness_ MDT
EDAPTS Specification Identifier	2.2.2.1
Metric Requirement	The maximum amount of time the MDT shall take to respond to driver or passenger input for normal (non-emergency) operations.
Verification Method	Test by timing user operations.

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by performing a regular input and / or query operations on a MDT. Time both UI responsiveness to input, and functional query response.
Implementation:	Bus 198 TEST BY LOGGING INTO MDT. | Bus 199 TESTED BY LOGGING IN
Comments:	VERY RESPONSIVE | VERY RESPONSIVE
Verification Requirements Met	YES ☒ NO ☐
Signature: NGD	Date: 2/2/9

2.2.5	processing_capacity_MDT
EDAPTS Specification Identifier	**2.2.2.9**
Metric Requirement	**The Mobile Data Terminal shall be capable of validating, logging, and forwarding to the central site the specified number of vehicle location and status per minute.**
Verification Method	**Verify in vendor specifications and inspect deliverables to ensure compliance**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations for a period of 30 minutes. Confirm nominal functionality with dispatchers using the ATRMS console(s).
Implementation: INSPECTED ON-BOARD HARDWARE, AND CONSOLE. (BUSES 198 & 199)	
Comments: APPROXIMATELY 10 UPDATES PER MINUTE	
Verification Requirements Met	YES ☒ NO ☐
Signature: NGH	**Date:** 2/2/9

2.2.6	time_of_day_clock_MDT
EDAPTS Specification Identifier	**2.2.4.2**
Metric Requirement	**The MDT shall have a large format clock to display time to the driver when the coach is in motion**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.

Implementation:

INSPECTED ON-BOARD HARDWARE ON 198 & 199

Comments:

[Duplicates testing done in 2.2.8.1]

DOES NOT IMPLEMENT FUNCTIONALITY. SCREEN GOES TO POWER-SAVING MODE.

Verification Requirements Met	**YES** ☐	**NO** ☒

Signature:	**Date:**
	2/2/09

2.2.7	stop_arrival_display_MDT
EDAPTS Specification Identifier	**2.2.4.3**
Metric Requirement	**The MDT shall display bus stop name to the driver upon arrival at a stop.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.

Implementation:

INSPECTED ON-BOARD HARDWARE.

Comments:

DOES NOT IMPLEMENT FUNCTIONALITY. MDT SCREEN GOES TO POWER-SAVE MODE.

Verification Requirements Met	YES ☐	NO ☒
Signature: MLO	**Date:** 2/2/09	

2.2.8	schedule_adherence_ display_MDT
EDAPTS Specification Identifier	2.2.4.4
Metric Requirement	The MDT shall display bus stop arrival schedule adherence information to the driver when at a stop
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.
Implementation: INSPECTED ON-BOARD HARDWARE.	
Comments: FUNCTIONALITY NOT IMPLEMENTED, BUT MAY BE IN THE FUTURE. SCREEN GOES TO POWER-SAVE MODE.	
Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 2/2/09

2.2.9	departure_countdown_ display_MDT
EDAPTS Specification Identifier	**2.2.4.5**
Metric Requirement	**The MDT shall display countdown until departure in minutes to a driver while at a stop or on break.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.
Implementation: INSPECTED ON-BOARD HARDWARE.	
Comments: DOES NOT IMPLEMENT FUNCTIONALITY.	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 2/2/09

2.2.10	detect_arrivals_&_departures_MDT
EDAPTS Specification Identifier	**2.2.4.11**
Metric Requirement	**The MDT shall have the capability to detect arrivals and departures from stops, when at a stop, and when between stops based on the transit schedule and master stop list.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.
Implementation: INSPECT ON-BOARD HARDWARE ON 198, 199	
Comments: THIS IS UNKNOWN SINCE NO FEEDBACK IS GIVEN TO THE DRIVER, AND LOCATION UPDATES ARE GIVEN EVEN WHEN THE MDT IS OFF.	
Verification Requirements Met	YES ☐ NO ☒
Signature: NCH	**Date:** 2/6/9

2.2.11	log_boarding_data_MDT
EDAPTS Specification Identifier	2.2.4.15
Metric Requirement	The MDT shall have the capability to log boarding and alighting data for retreival and post processing.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.
Implementation: REVIEWED DOCUMENTATION PROVIDED.	
Comments: ASK SYNCROMATICS.	
Verification Requirements Met	YES ☒ NO ☐
Signature: [signature]	Date: 3/7/19

2/3/09
247

Time	People on	STOP
10:33	6 on	CIA
10:35	3	Info booth
10:41	15	University Village
10:44	2	So Campus / Temple
10:48	2	Env design
10:50	5	94
10:53	0	Rosa garden
10:54	0	SAITS
10:55	0	CLA

227

1)	—	—	Marketplace
2)	11:12	0	
3)	11:14	0	
4)	11:15	1	- Blue Sign
5)	11:17	3	
6)	11:18	2	
7)	11:21	0	
1)	11:23	2	
2)	11:29	0	
3)	11:32	4	
4)	11:34	0	
5)	11:35	3	
6)	11:37	1	
7)	11:39	0	

National Brand 42-381 50 SHEETS EYE-EASE® 5 SQUARES
42-382 100 SHEETS EYE-EASE® 5 SQUARES
42-389 200 SHEETS EYE-EASE® 5 SQUARES

ROUTE A

12-3-09

BUS 247

STOP	TIME	# OFF	
CLA	10:33	1	
INFO BOOTH	10:~~36~~35	0	
UNIV VILLAGE	10:41	9	
TEMPLE/SB CAMP	10:44	0	
ENV. DESIGN	10:48	6	
Building 94	10:50	11	* - 1 STOOD AT DOOR
ROSE GARDEN	10:53	2	
SAITS	10:54	1	
CLA	10:55	2	

STARTED @ 9

BUS ~~198~~ 227 ROUTE C

STOP	TIME	# OFF	
#2	11:11	3	BY ENV DESIGN
#3	11:14	3	
#4	11:15	0	// B-LOT BY BASEBALL
#5	11:17	0	
#6	11:18	1	
#7	11:21	0	
#[illegible]	11:23	6	
#2	11:29	1	
#3	11:32	1	
#4	11:34	0	
#5	11:35	0	
#6	11:37	0	
#7	11:39	0	
#1	11:41	9	

BUS 247 2/3/2009

Observed data			
Time	On	Off	Stop
10:33	6	1	CLA
10:35	3	0	Info Booth
10:41	15	9	Village
10:44	2	0	Temple
10:48	2	6	Env Design
10:50	5	11	94
10:53	0	2	Rose Garden
10:54	0	1	SAITS
10:55	0	2	CLA
Total	**33**	**32**	

Computer data			
Time	On	Off	Stop
10:33	4	1	CLA
10:35	3	0	Info Booth
10:43	18	7	Village
10:44	2	0	Temple
10:49	2	6	Env Design
10:52	4	9	94
10:53	0	2	Rose Garden
10:54	0	1	SAITS
10:56	0	2	CLA
Total	**33**	**28**	

Error			
On	% Error	Off	% Error
2	33%	0	0%
0	0%	0	0%
3	20%	2	22%
0	0%	0	0%
0	0%	0	0%
1	20%	2	18%
0	0%	0	0%
0	0%	0	0%
0	0%	0	0%
Average	**8%**		**4%**

BUS 227 2/3/2009

Observed data			
Time	On	Off	Stop
11:11	0	3	Bio Trech
11:14	0	3	Entrance to B
11:15	1	0	Lot B
11:17	3	0	Entrance to K
11:18	2	1	Lot K
11:21	0	0	Bio Trech
11:23	2	6	Marketplace
11:29	0	1	Bio Trech
11:32	4	1	Entrance to B
11:34	0	0	Lot B
11:35	3	0	Entrance to K
11:37	1	0	Lot K
11:39	0	0	Bio Trech
Total	**16**	**15**	

Computer data			
Time	On	Off	Stop
11:11	0	4	Bio Trech
11:14	0	4	Entrance to B
11:15	1	0	Lot B
11:17	3	0	Entrance to K
11:18	3	0	Lot K
11:21	0	0	Bio Trech
11:23	2	5	Marketplace
11:29	1	0	Bio Trech
11:32	4	1	Entrance to B
11:34	0	0	Lot B
11:35	2	0	Entrance to K
11:37	1	0	Lot K
11:39	0	0	Bio Trech
Total	**17**	**14**	

Error			
On	% Error	Off	% Error
0	0%	1	33%
0	0%	1	33%
0	0%	0	0%
0	0%	0	0%
1	50%	1	100%
0	0%	0	0%
0	0%	1	17%
1	100%	1	100%
0	0%	0	0%
0	0%	0	0%
1	33%	0	0%
0	0%	0	0%
0	0%	0	0%
Average	**14%**		**22%**

2.2.12	system_administration_MDT
EDAPTS Specification Identifier	2.2.4.16
Metric Requirement	The MDT shall have the capability to be remotely administered from the central site.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by using ATRMS to perform remote administration.

Implementation:

REVIEWED DOCUMENTATION PROVIDED.

Comments:

ASK SYNCROMATICS, BUT ADMINISTRATION NOT NECESSARY IN A SERVICE-BASED MODEL.

SYNCROMATICS SAYS YES, BUT THIS IS NOT FOUND IN THE WEB-CONSOLE.

Verification Requirements Met	YES ☒ NO ☐

Signature: NGH	Date: 3/7/19

2.2.13	log_arrival_departure_data_MDT
EDAPTS Specification Identifier	2.2.4.17
Metric Requirement	The MDT shall have the capability to log stop departure and arrival data for retreival and post processing.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Enlist assistance from Syncromatics to test 25% random sampling of installations by obtaining stored logs.
Implementation: REVIEWED PROVIDED DOCUMENTATION	
Comments: ASK SYNCROMATICS. → CONFIRMED, UNABLE TO TEST.	
Verification Requirements Met	YES ☒ NO ☐
Signature: [signature]	Date: 3/7/9

2.2.14	declare_on_board_emergency_MDT
EDAPTS Specification Identifier	**2.2.4.18**
Metric Requirement	**The MDT shall have the capability to declare on-board emergencies to central dispatch and then send regular position updates to the central site.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by using the MDT to declare an emergency and send a mayday message.
Implementation: BUS 198 INSPECTED ON-BOARD HARDWARE / BUS 195 INSPECTED ON-BOARD HARDWARE	
Comments: [Duplicates testing done in 1.1.7.2] BUTTON ON SCREEN/MDT / BUTTON ON SCREEN/MDT TESTED EMERGENCY BUTTON AND RECIEVED BY DISPATCH	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/2/19

2.2.15	survey_stops_MDT
EDAPTS Specification Identifier	**2.2.4.19**
Metric Requirement	**The MDT shall have the capability to survey route stops for latitude, longitude, and direction (heading).**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by enabling site-survey functionality on MDT, and surveying an imaginary stop. Collect data, and verify collected information against mapping software or similar verification method.
Implementation: REVIEWED DOCUMENTATION.	
Comments: WE DONT THINK SO. NEED TO ASK SYNCROMATICS ↳ THEY RECOMMEND USING BREAD-CRUMB DATA WITH DOOR-OPEN RECORDS FOR SURVEYING. NO ACTUAL FUNCTIONALITY	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 3/7/19

2.2.16	admin_data_comm_MDT
EDAPTS Specification Identifier	**2.2.4.20**
Metric Requirement	**The MDT shall have the capability to communicate with the central site to support administrative functions such as software updates, schedule downloads, and retrieval of data logged on the MDT.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by testing remote administration functionality of onboard systems from dispatcher ATRMS console.
Implementation:	
Comments: [Duplicates testing done in 2.2.4.16]	NOT APPLICABLE IN SERVICE-BASED MODEL, BUT SHOULD ASK SYNCROMATICS. ↳ CAN BY DONE BY SERVICE-PROVIDER
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 3/7/9

2.2.17	self_test_MDT
EDAPTS Specification Identifier	2.2.4.21
Metric Requirement	The MDT shall have the capability to perform a comprehensive self-test upon power up.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing power-on self-tests of MDT.

Implementation:

OBSERVED BOOT ON 198 & 199

Comments:

MINIMAL TESTING OF HARDWARE BY OPERATING SYSTEM. NO TESTING OTHER THAN CONNECTING TO SERVER BY SOFTWARE.

Verification Requirements Met	YES ☐ NO ☒
Signature: Wolf	Date: 4/3/19

2.2.18	commanded_diagnostics_MDT
EDAPTS Specification Identifier	**2.2.4.22**
Metric Requirement	**The MDT shall have the capability to perform self-test and diagnostics of other on-board devices upon a command from the MDT front panel (user interface).**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by enabling self-test diagnostics on the MDT. Document results.

Implementation:

TESTED MDT ON 199

Comments:

~~NOT IMPLEMENTED~~

[Duplicates testing done in 2.1.2.2]

NO DIAGNOSTICS IN ADMIN MODE, ONLY A LOG (MINIMAL).

Verification Requirements Met	YES ☐ NO ☑
Signature:	**Date:** 2/3/9

2.2.19	ergonomics_accessibility_MDT
EDAPTS Specification Identifier	**2.2.5.1**
Metric Requirement	**The MDT controls and interface shall be easily operable by the driver without requiring a significant shift from driving position.**
Verification Method	**Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test randomly chosen installation by sitting in driver's position, and operating MDT. Document in detail the ergonomics of performing regular operations.

Implementation:

SAT IN DRIVER'S POSITION,

Comments:

EASILY ABLE TO OPERATE MDT. (WHEN IT'S NOT SHAKING)

Verification Requirements Met	**YES** ☒ **NO** ☐
Signature:	**Date:** 2/2/9

2.2.20	ergonomics_readability_MDT
EDAPTS Specification Identifier	2.2.5.2
Metric Requirement	The MDT display shall be clearly readable by the driver from its installation location as he or she conducts normal operations. The MDT display shall maintain clear readability under both day and night-time conditions.
Verification Method	Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test randomly chosen installation with at least two testers possessing 20/20 or 20/20 corrected vision. Document findings in detail.
Implementation: NEIL & RYAN SAT IN DRIVER'S POSITION	
Comments: BOTH ABLE TO READ EASILY.	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 7/2/9

2.2.21	ergonomics_ease_of_use_MDT
EDAPTS Specification Identifier	**2.2.5.4**
Metric Requirement	**The MDT shall provide a simple, easy to use, uncluttered interface to the driver. All commonly used actions such as log-in, log-out, and route-change shall be easily accesible and provide integrated step-by-step instructions. Buttons and screen controls shall be easily used and activated.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test randomly chosen installation by using MDT to perform above actions. Document findings in detail.
Implementation:	INSPECTED ON-BOARD HARDWARE.
Comments:	LOG-IN & LOG-OUT AVAILABLE. CHANGE ROUTE AVAILABLE AT LOG-IN, BUT NOT LATER → DRIVER MUST SIGN OUT AND SIGN BACK IN, BUT MDT WILL DETECT ROUTE AFTER DRIVING 1-2 TRIPS OF A ROUTE. (DRIVERS NOT LOGGING IN)
Verification Requirements Met	YES ☒ NO ☐
Signature: NMcH	**Date:** 2/2/9

2.2.22	ergonomics_driver_interaction_MDT
EDAPTS Specification Identifier	2.2.5.5
Metric Requirement	The MDT shall require minimal interaction by the driver as during normal driver operations.
Verification Method	Verify in vendor specifications.

Verification Procedure	Review design documentation provided by Syncromatics. Test by observing 25% random sampling of installations while in operation on-route for at least 30 minutes. Document findings in detail.

Implementation:

INSPECTED TWO BUSES.

Comments:

D/D NOT OBSERVE AS SCREEN GOES DARK (POWER-SAVE) AFTER LOGIN, AND DOES NOT PROVIDE DRIVER FEEDBACK.

Verification Requirements Met	YES ☒ NO ☐
Signature: MKG	Date: 2/2/09

2.2.23	stop_detection_reliability_MDT
EDAPTS Specification Identifier	**2.2.7.1**
Metric Requirement	**The MDT shall detect stops with the specified percent reliability when GPS is available.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test by observing 25% random sampling of installations while in operation on-route for at least 30 minutes. Ensure onboard stop detection is presented to driver. Inspect schedule adherence reports to confirm 99.5% stop detection.

Implementation:

NO MAT FEEDBACK AVAILABLE, SO INSPECT ATRIUS CONSOLE.

Comments:

DOES NOT APPEAR MAT DOES STOP DETECTION, NOT FEEDBACK DISPLAYED TO DRIVER

Verification Requirements Met	**YES** ☐	**NO** ☒

Signature: NCH	**Date:** 2/6/19

2.2.24	coach_in_motion_MDT
EDAPTS Specification Identifier	2.2.8.1
Metric Requirement	The Mobile Data Terminal shall detect when the vehicle is in motion, and shall blank its screen to prevent driver distraction. Display of the time in large characters is acceptable.
Verification Method	Verify in system design document or specifications. Test deliverables to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test by observing 25% random sampling of installations for at least 30 minutes.
Implementation: INSPECTED ON-BOARD HARDWARE.	
Comments: SCREEN IS ALWAYS BLANK → GOES TO POWER-SAVE MODE	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/2/9

2.2.25	time_reporting_accuracy_MDT
EDAPTS Specification Identifier	**2.2.9.2**
Metric Requirement	**Time estimates shall be accurate within the specified number of seconds.**
Verification Method	**Test deliverables to ensure compliance or inspect supplied certifications**

Verification Procedure	Review design documentation provided by Syncromatics. Using an accurate time-keeping device that has been synchronized with either NIST or GPS time, test by observing 25% random sampling of installations for at least 30 minutes. Compare system reported arrival times with observed times, ensuring 1 second minimum accuracy.

Implementation:

REVIEWED DOCUMENTATION PROVIDED.

Comments:

NEED TO ASK SYNCROMATICS, BUT MAT DOESN'T PROVIDE INFORMATION TO THE DRIVER.

↳ SYNCROMATICS CERTIFIED THAT ALL DEVICES SYNC UPON BOOT, AND HAVE 1 SECOND ACCURACY.

Verification Requirements Met	**YES** ☒ **NO** ☐
Signature: MDH	**Date:** 3/7/19

2.2.26	accessibility_E-Actuator
EDAPTS Specification Identifier	2.6.17.1
Metric Requirement	The Emergency Actuator shall be operable from the driver's position, and shall able to unobtrusively activated in the event of an emergency. The actuator shall be resistant to accidental activation due to normal movement in the driver's compartment.
Verification Method	Test installation to ensure compliance.

Verification Procedure	Test 25% random sampling of installations by ensuring mayday activation mechanism is not readily visible and that it is resistant to accidental activation. Document findings in detail.
Implementation:	INSPECTED ON-BOARD HARDWARE.
Comments:	FUNCTIONALITY IS OPERABLE FROM THE DRIVER'S COMPARTMENT, BUT BUTTON IS NOT UNOBTRUSIVE. HAVE BEEN REPORTS OF ACCIDENT ACTIVATION BY DRIVER, AND BUTTON BEING LEANED ON AND PRESSED INTO THE DASHBOARD.
Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 2/2/9

2.2.27	emergency_signaling_accuracy_OBS
EDAPTS Specification Identifier	**2.6.19.1**
Metric Requirement	**The emergency actuator shall not allow false signaling of an emergency.**
Verification Method	**Test deliverables to ensure compliance or inspect supplied certifications**

Verification Procedure	Review design documentation provided by Syncromatics. Check dispatcher operations logs to determine if false activations have been reported.

Implementation:

CHECKED DISPATCHER CONSOLE LOGS.

Comments:

MANY FALSE ACTIVATIONS DUE TO DRIVERS TESTING THE BUTTON, LEANING ON THE MDT, AND MDT PRESSING INTO THE DASHBOARD.

Verification Requirements Met	YES ☐ NO ☒

Signature:	**Date:** 2/2/9

2.2.28	latency_OBS_Wireless_ Communications
EDAPTS Specification Identifier	**3.3.3.1**
Metric Requirement	**Maximum time for vehicle-update messages sent from the On-Board System to be received by the CSS under typical system load conditions.**
Verification Method	**Test by measuring time delay**

Verification Procedure	Test 25% random sampling of installations for at least 30 minutes by measuring time delays in transmission by confirming receipt by dispatch using radio or cellular communication. Maximum allowable delay is 15 seconds.

Implementation:

TESTED TWO-WAY MESSAGING WITH DISPATCH FROM 199.

Comments:

ROUND-TRIP MESSAGE WITH ANSWER ~30SEC.
ONE MESSAGE APPROX. 10 SECONDS.

Verification Requirements Met	YES ☒ NO ☐

Signature:	**Date:** 2/3/9

2.2.29	throughput_OBS_Wireless_ Communications
EDAPTS Specification Identifier	3.3.3.3
Metric Requirement	The On-Board Wireless Communications system shall have a sufficient data-communications throughput rate to ensure that all vehicles in the fleet with the specificed update frequency,
Verification Method	Test by measuring throughput

Verification Procedure	Test by observing dispatch ATRMS console. Ensure that all vehicles update their position at least once per minute for a 30 minute period.

Implementation:

OBSERVED DISPATCHER CONSOLE.

Comments:

ALL VEHICLES RUNNING UPDATED THEIR POSITION MULTIPLE TIMES PER MINUTE FOR THE 30 MIN OBSERVATION PERIOD.

Verification Requirements Met	YES ☒ NO ☐

Signature:	Date: 2/2/9

2.2.30	georeference_stop-point_accuracy
EDAPTS Specification Identifier	9.2.2.1
Metric Requirement	Latitude and longitude estimates shall be accurate to within the specified number of minutes.
Verification Method	Inspect supplied certifications

Verification Procedure	Test by obtaining stop-point latitude/longtitude from the system, and using portable GPS equipment verify position of 10% bus stop locations to an accuracy of 10 meters.

Implementation:

TESTED STOP AND COMPARED WITH VALUES PROVIDED BY THE SYSTEM.

Comments:

MOST STOPS WITHIN 10-15 FEET.

Verification Requirements Met	YES ☒ NO ☐

Signature: Nath	Date: 2/6/9

2.2.31	prompt_for_driver_MDT
EDAPTS Specification Identifier	**2.2.4.12**
Metric Requirement	**The MDT shall have the capability to prompt a driver for their ID number upon login, and then associate the ID number with an ID number / name cross reference in the MDT.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.

Implementation:

TESTED ON-BOARD HARDWARE.

Comments:

[May not be necessary for Pomona installation]

WAS ABLE TO LOG-IN WITH DRIVER ID.

Verification Requirements Met	YES ☒	NO ☐
Signature:	**Date:** 2/2/9	

2.2.32	prompt_for_route_number_MDT
EDAPTS Specification Identifier	**2.2.4.13**
Metric Requirement	**The MDT shall have the capability to prompt a driver for route number upon login.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.
Implementation: INSPECTED ON-BOARD HARDWARE. ON 198 & 199.	
Comments: [May not be necessary for Pomona installation] WAS ABLE TO INPUT ROUTE.	
Verification Requirements Met	YES ☒ NO ☐
Signature:	**Date:** 2/2/9

2.2.33	ergonomics_audibility_MDT
EDAPTS Specification Identifier	**2.2.5.3**
Metric Requirement	**All sounds, tones, or other audible feedback generated by the MDT shall be of sufficient volume to be audible in the driver's compartment above background vehicle noise.**
Verification Method	**Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by observing normal operations to ensure functionality.
Implementation:	
Comments:	NEED TO TEST MESSAGING, OTHERWISE NO OTHER DRIVER FEEDBACK. MESSAGING PROVIDES TONE, BUT VOLUME IS LOW ENOUGH THAT IT CAN BE MASKED BY VEHICLE NOISE.
Verification Requirements Met	**YES** ☐ **NO** ☒
Signature: NCaff	**Date:** 2/3/9

2.2.34	backup_power_OBS_Comm_emergency_management
EDAPTS Specification Identifier	**3.1.3.3**
Metric Requirement	**Minimum period of autonomous operation required to support emergency functionality in the event of a power loss.**
Verification Method	**Test by measuring time delay**

Verification Procedure	Review design documentation provided by Syncromatics. Test by removing power from server-side OBS communications equipment

Implementation:

NA REVIEWED DOCUMENTATION PROVIDED.

Comments: ASK SYNCROMATICS

[May not be necessary for Pomona installation]

→ NO INTERNAL POWER, BUT VEHICLE BATTERIES PROVIDE MORE THAN SUFFICIENT AUTONOMY.

Verification Requirements Met	YES ☒	NO ☐
Signature:		**Date:** 3/7/19

2.3.1	removal_and_replacement_RID
EDAPTS Specification Identifier	**4.1.1.1**
Metric Requirement	**Roadside Information Display elements shall be able to be removed and replaced within the specified amount of time.**
Verification Method	**Test installation to ensure compliance.**

Verification Procedure	Enlist assistance of Syncromatics and qualified personnel. Time the removal and replacement of onboard MDT, verifying whether or not it meets the 30 minute requirement.
Implementation: NOT APPLICABLE	
Comments:	
Verification Requirements Met	YES ☐ NO ☐ N/A
Signature:	**Date:**

2.3.2	self_diagnostics_RID
EDAPTS Specification Identifier	4.1.1.2
Metric Requirement	The Roadside Information Display shall provided self-test diagnostics to aid in fault isolation.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test 25% random sampling of installations by enabling self-test diagnostics on the RID. Document results.
Implementation:	REVIEWED DOCUMENTATION, AND REQUEST CLARIFICATION FROM SYNCROMATICS.
Comments:	NO USER-ACCESSIBLE DIAGNOSTICS. SERVICE-PROVIDER CAN RUN THEM THOUGH.
Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 3/7/19

2.3.3	banner_message_size_RID
EDAPTS Specification Identifier	4.2.3.2
Metric Requirement	The Dynamic Roadside Information Display shall be capable of receiving and then displaying banner messages up to the given character limit.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test by using dispatcher ATRMS console to send 40 character to a sign. Verify receipt and display of message.

Implementation:

INSPECTED CONSOLE SOFTWARE.

Comments:

FUNCTIONALITY NOT IMPLEMENTED, BUT PLANNED FOR FUTURE.

Verification Requirements Met	YES ☐	NO ☑
Signature:		Date: 2/2/09

2.3.4	provide_ETA_RID
EDAPTS Specification Identifier	4.2.3.4
Metric Requirement	The Dynamic Roadside Information Display shall have the capability to present minutes until arrival for buses arriving at a stop based on real-time bus trajectory.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test by observing installations to confirm functionality.
Implementation: OBSERVED SIGN	
Comments: (NEED TO CHECK ACCURACY) NEED TO DISCUSS	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/2/9

2.3.5	out_of_service_info_RID
EDAPTS Specification Identifier	**4.2.3.5**
Metric Requirement	**The Dynamic Roadside Information Display shall have the capability to indicate when it is out of service to passengers waiting at a stop.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test by observing installations during non-operating hours to confirm functionality.
Implementation: OBSERVED SIGNS	
Comments: DOES NOT INDICATE OUT-OF-SERVICE, JUST GOES BLANK ↳ NO VISUAL DISPLAY TO CONSERVE POWER, BUT PROVIDES AUDIO ANNUNCIATION WHEN BUTTON IS PRESSED (3/5/09)	
Verification Requirements Met	YES ☒ NO ☒
Signature:	**Date:** 2/2/09

2.3.6	ADA_RID
EDAPTS Specification Identifier	4.2.3.6
Metric Requirement	The Dynamic Roadside Information Display shall be capable of supporting the optional dissemination of information to riders with hearing and sight disabilities in accordance with the Americans with Disabilities Act (ADA).
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test by observing installations to confirm functionality.
Implementation: OBSERVED SIGNS	
Comments: STATIC MESSAGES IMPLEMENTED READABLE FROM > 50 FT	
Verification Requirements Met	YES ☒ NO ☐
Signature:	Date: 2/2/9

2.3.7	time_reporting_accuracy_Sign
EDAPTS Specification Identifier	**4.2.7.1**
Metric Requirement	**Estimated minutes until arrival shall be accurate to within the specified number of seconds.**
Verification Method	**Test deliverables to ensure compliance or inspect supplied certifications**

Verification Procedure	Review design documentation provided by Syncromatics. Test by observing at least two installations for 30 minutes by comparing reported arrival times with actual arrival times to confirm 60 second accuracy.

Implementation:

TESTED ALL THREE SIGNS FOR AT LEAST 30 MINS EACH.

Comments:

MANY PROBLEMS, SEE DATA.

Verification Requirements Met	**YES** ☐ **NO** ☒

Signature:	**Date:** 2/3/9

Bus Arrivals @ CSA (2009.02.02)

8 character display

17:40 – B2 in 12 mins
A in 13 mins

17:43 – A in 8 mins
17:44 – A in 7 mins
} No B-2

17:46 – A in 4 mins
B2 in 12 mins

17:48 – A in 3 mins
B2 in 11 mins

17:49 – A in 2 mins
B2 in 10 mins

17:50 – A ~~arrives~~ in 2 mins
B2 in 9 mins
B1 arrives

17:51 – A in 1 min
B2 in 8 min

17:52 – A arrives
B2 in 7 min
} "Route A: Bus in arriving"

17:55 – A "arriving"
B2 in 7 min

17:58 – A "arriving"
B2 in 3 mins

17:59 – A in 19 mins
B2 in 2 mins

18:00 – A in 19 mins
B2 in 2 mins ~~arrives~~

18:01 – A in 18 mins
B2 – arrives "in arriving"

18:02 – A in 14 mins
B2 in 45 mins

University Village

2/3/9

10:44 – A in 4 min, 14 min
10:46 – A arrives
"A in 4 min / 14 min"
10:47 – A in 4 / 14 min
10:48 – A in 17, 20 min
10:49 – A in 13, 15 min
10:53 – A in 13, 15 min
10:54 – A in 9, 10 min
10:57 – A in 9, 10 min
11:00 – A in 9 min
11:03 – A in 9 min
11:04 – A (247) arrives → driver says Don (199) went on lunch break
"A in 9 min"
11:10 – "A in 9 min"
11:11 – A in 20 min → Bus 139 arrives (no MDT)
11:12 – A in 17 min
11:14 – A in 14 min
11:15 – A in 14 min → Bus 139 departs
11:17 – A in 14 min
11:20 – A in 10 min
11:22 – A in 8 min
11:23 – A in 6 min
11:25 – A in 6 min
11:27 – A in 4 min → Bus 247 arrives
11:29 – A in 4 min → Bus 247 departs
11:31 – A in 4 min
11:32 – A in 4 min
11:33 – A in 21 min
11:34 – A in 20 min
11:35 – A in 19 min → Bus 139 arrives

BUILDING 94

2/3/9

11:48 – B2 IN 4 MIN
A IN 15, 16 MIN

11:50 – B2 IN 2 MIN
A IN 3, 13 MIN

11:52 – B2 IN 2 MIN
A IN 1, 12 MIN
→ A(198) ARRIVES, B-2 ARRIVES & DEPARTS

11:54 – B2 IN 26 MIN
A IN ARRIVING, 8 MIN
→ A(198) DEPARTS

11:55 – B2 IN 24 MIN
A IN 8, 22 MIN

11:57 – B2 IN 24 MIN
A IN 8, 22 MIN

12:00 – B2 IN 22 MIN
A IN 4, 17 MIN

12:02 – B2 IN 21 MIN
A IN 4, 12 MIN

12:04 – B2 IN 17 MIN
A IN ARRIVING, 8 MIN
→ A(247) ARRIVES

12:06 – B2 IN 17 MIN
A IN ARRIVING, 8 MIN
→ A(247) DEPARTS
→ B(64) ARRIVES

12:07 – B2 IN 16 MIN
A IN 4, 24 MIN

12:08 – B2 IN 15 MIN
A IN 4, 23 MIN
→ B(64) DEPARTS

12:11 – B2 IN 14 MIN
A IN 3, 22 MIN
→ A(198) ARRIVES

12:12 – B2 IN 12 MIN
A IN ARRIVING, 21 MIN
→ A(198) DEPARTS

12:13 – B2 IN 12 MIN
A IN ARRIVING, 21 MIN

12:14 – B2 IN 11 MIN
A IN 17, 19 MIN

12:16 – B2 IN 11 MIN
A IN 17, 19 MIN

12:19 – B2 IN 7 MIN
A IN 9, 10 MIN

12:21 – B2 IN 4 MIN
A IN 6, 9 MIN

BUILDING 9&4

2/3/9

12:23 – B2 IN 4 MIN
A IN 6, 9 MIN

12:25 – B2 IN 4 MIN
A IN 6, 9 MIN → B(71) ARRIVING, DEPARTS

12:26 – B2 IN ARRIVING
A IN 4, 6 MIN

12:27 – B2 IN 31 MIN
A IN 2, 6 MIN

12:29 – B2 IN 29 MIN
A IN 1, 4 MIN → A(247) ARRIVES

12:30 – B2 IN ~~ARRIVING~~ 27 MIN → A(247) DEPARTS
A IN ARRIVING, 4 MIN

12:31 – B2 IN 26 MIN
A IN ARRIVING, 4 MIN

12:32 – B2 IN 24 MIN
A IN 3, 21 MIN

2-10-09 BUILDING 94 STOP

14:49 B-2 - in 36 min
A - in 5min, 7min

14:51 B2 in 34min
A in 4min, 7min

14:53 B-2 in 33min
A in 3min, 5min

14:54 B-2 in 31min
A in 1min, 3min

14:55 - RTA BUS 24 ARRIVES
- B-2 in 29min
A in arriving, 1min

14:56 - B2 - in 29min
A - in arriving, 1min

14:57 - RT A BUS 198 ARRIVES
- B2 BUS in 24min
A in arriving, arriving

14:58 B2 in 21min
A in arriving, arriving

15:00 B2 in 20min
A in arriving, 59 min

15:01 B2 in 18min
A in 57min, 59min

15:03 B2 in 16min,
A in 57 min, 57 min

15:04 B2 in 16 mn — 2 students saw sign & LEFT
A in 55 min, 56min

15:05 Rt BUS 138 ARRIVES

15:06 B2 in 13 min
A in 13 mn, 53 min

15:08 B2 in 11mn
A in 10min, 12 min

15.09 ROUTE B-1 BUS ARRIVES — 200064
B2 in 10mn
A in 10min, 10min

15:10 B-2 in 10min
A in 10min, 10min

15:15 B-2 in 4min
A in 5min

15:18
A in 3min, 13min

15:19 B-2 in 4mn
A in 1min, 55min

15:20 Rt A BUS ARRIVES — CA 15789
B-2 in 1min
A in arriving

15-21 Rt B-2 BUS ARRIVES — CA 200171
B-2 in 1min
A in arriving

15:22 B-2 IN 37 MIN
A IN ARRIVING

15:23 B-1 IN 58 MIN — FIRST TIME I'VE SEEN B-1 ON THE SIGN
B2 IN 36 MIN (I DON'T THINK ANY B-1 BUS HAS SYNCROMATICS EQUIPMENT
A IN 20 MIN

15:24 RT A BUS 138 ARRIVES

15:25 B-2 IN 35 MIN
A IN 20 MIN

15:26 B-2 IN 34 MIN
A IN 20 MIN

15:27 B-2 IN 33 MIN
A IN 18 MIN

15:28 B-2 IN 31 MIN
A IN 16 MIN

15:29 B-1 IN 58 MIN
B-2 IN 29 MIN
A IN 15 MIN

15:30 B-1 IN 58 MIN
B-2 IN 26 MIN
A IN 14 MIN

15:31 B-1 IN 58 MIN
B-2 25 MIN
A IN 14 MIN

15:32 B-1 IN 58 MIN
B-2 IN 24 MIN
A IN 12 MIN

15:33 B-1 IN 58MIN
B-2 IN 21MIN
A IN 11MIN

15:34 B-1 IN 58MIN
B-2 IN 20MIN
A IN 8MIN

15:35 B-1 IN 58MIN
B-2 IN 20MN
A IN 8MIN

15:36 B-2 18MN
A IN 7MIN

15:38 B-2 IN 16MIN
A IN 4MIN

(NOT SURE ABOUT APC OR GPS)
200064 RT B-1 BUS ARRIVES (MDT IS INSTALLED)

15:40 B-2 IN 15MIN
A IN 1MIN

15:41 BUS 247 RT A ARRIVES (LEAVES AT 15:43)

15:42 B-2 IN 15 MIN
A IN ARRIVING

15:43 B-2 IN 15 MIN
A IN ARRIVING

ONLY TOOK 1MIN TO RESET

15:44 B-2 IN 15MIN
A IN 17MIN

15:46 B-2 IN 15MIN
A IN 15 MIN

15:48 RT A 138 ARRIVES
A IN 14MIN

15:49 RT A IN 13 MIN

15:50 A IN 12 MIN

15:51 A IN 11 MIN

15:52 A IN 10 MIN

15:55 A IN 6 MIN

15:57 A IN 4 MIN

15:59 A IN 4 MIN

2.3.8	latency_RID_Communications
EDAPTS Specification Identifier	5.2.1.1
Metric Requirement	Maximum time for vehicle-update messages sent from the CSS to be received by the RID under typical system load conditions.
Verification Method	Test by measuring time delay

Verification Procedure	Test 25% random sampling of installations for at least 30 minutes by measuring time delays in transmission by confirming receipt by dispatch using radio or cellular communication. Maximum allowable delay is 15 seconds.

Implementation:

UNABLE TO TEST, REQUESTED CERTIFICATION FROM SERVICE PROVIDER → LATENCY IS 1-2 SECONDS.

Comments:

Verification Requirements Met	YES ☒ NO ☐

Signature:	Date: 3/7/9

2.3.9	throughput_RID_Communications
EDAPTS Specification Identifier	5.2.1.3
Metric Requirement	The Roadside Information Display Communications system shall have a sufficient throughput rate to ensure that all vehicles in the fleet with the specificed update frequency.
Verification Method	Test by measuring throughput

Verification Procedure	Test 25% random sampling of installations for at least 30 minutes by observing to confirm that all routes served by the RID are displayed with estimated time of arrival.

Implementation:

OBSERVED 3 OF 4 SIGNS FOR AT LEAST 45 MINS EACH.

Comments:

ALL SIGNS HAVE SUFFICIENT THROUGHPUT.

Verification Requirements Met	YES ☒	NO ☐
Signature:		Date: 2/17/9

2.3.10	command_and_control_RID
EDAPTS Specification Identifier	4.2.3.1
Metric Requirement	The RID shall be able to have configuration and system schedule information downloaded to it remotely from the central site.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test by using dispatcher ATRMS console to remotely administer RID installations.
Implementation: NOT APPLICABLE	
Comments:	
Verification Requirements Met	YES ☐ NO ☐ N/A
Signature:	Date:

2.3.11	banner_message_quantity_RID
EDAPTS Specification Identifier	4.2.3.3
Metric Requirement	The Dynamic Roadside Information Display shall be capable of storing and then displaying at least the given number of individual public service banner messages..
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test by using dispatcher ATRMS console to store at least 25 banner message in a RID.
Implementation: OBSERVED CONSOLE	
Comments: NOT IMPLEMENTED	
Verification Requirements Met	YES ☐ NO ☒
Signature:	Date: 2/2/09

2.4.1	user_input_responsiveness_ ATRMS
EDAPTS Specification Identifier	6.1.1.1
Metric Requirement	The maximum amount of time the ATRMS shall take to respond to operator input for vehicle tracking operations.
Verification Method	Test by timing user operations.

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console by performing regular vehicle tracking operations. UI response time to input should be less than 1 second.

Implementation:

TESTED CONSOLE FOR RESPONSIVENESS.

Comments:

USER RESPONSIVE, SCREENS INVOLVING GOOGLE INPUT

MAP-BASED DISPLAYS TAKE SEVERAL SECONDS TO LOAD.

Verification Requirements Met	YES ☒ NO ☐

Signature: NGH	Date: 2/2/9

2.4.2	emergency_handling_quantity_CSS
EDAPTS Specification Identifier	6.1.2.2
Metric Requirement	The central software shall be capable of supporting at least the given number of simultaneous emergency conditions.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Outside of system normal operating hours, test by triggering maydays from a minimum of 5 vehicles. Confirm system capability to handle simulataneous emergency conditions.

Implementation:

TESTED EMERGENCY FUNCTIONALITY.
EMERGENCIES ARE TREATED THE SAME AS TEXT MESSAGES → NO SPECIAL HANDLING.
NO NEED TO DO 5 BUSES.

Comments:

Verification Requirements Met	YES ☒	NO ☐
Signature: NCH	Date: 2/3/9	

2.4.3	time_reporting_accuracy_Traveler_API
EDAPTS Specification Identifier	**8.8.18.1**
Metric Requirement	**Time estimates shall be accurate within the specified number of seconds.**
Verification Method	**Test deliverables to ensure complinace or inspect supplied certifications**

Verification Procedure	Review design documentation provided by Syncromatics. Test by requesting reporting information via API, and confirming results are with 30 second accuracy.

Implementation:

N/A

Comments:

[May not be necessary for Pomona installation]

NOT IMPLEMENTED

↳ SYNCROMATICS REPORTS THAT ALL INFORMATION IS AVAILABLE FROM UNDERLYING XML FEEDS. (3/5/19)

Verification Requirements Met	**YES** ☐	**NO** ☒
Signature: NOH	**Date:** 2/3/19	

2.5.1	GUI_readability_ATRMS
EDAPTS Specification Identifier	**6.1.3.1**
Metric Requirement	**The ATRMS GUI shall be readable by employees of varying visual capabilities.**
Verification Method	**Test installation to ensure compliance.**

Verification Procedure	Test by operating dispatcher ATRMS console with at minimum of three different operators to ensure conformance.
Implementation:	INSPECT CONSOLE AND TESTED VARIOUS FUNCTIONALITY.
Comments:	READABLE BY NEIL, PATRICK, AND RYAN. DOES NOT APPEAR TO HAVE ADJUSTABLE FONT SIZING THOUGH.
Verification Requirements Met	YES ☒ NO ☐
Signature: NGH	**Date:** 2/2/9

2.5.2	font_scalability_ATRMS
EDAPTS Specification Identifier	6.1.3.2
Metric Requirement	ATRMS display fonts shall be scalable from small to large.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Test by operating dispatcher ATRMS console to ensure functionality

Implementation:

INSPECTED CONSOLE.

Comments:

FONT SCALING FROM WITHIN CONSOLE. SINCE IT IS WEB-BASED, COULD BE ADJUSTED FROM BROWSER, OR OPERATING SYSTEMS.

Verification Requirements Met	YES ☐ NO ☒

Signature:	Date: 2/2/9

2.5.3	backup_power_ATRMS_emergency_management
EDAPTS Specification Identifier	6.1.4.1
Metric Requirement	Minimum period of autonomous operation required to support emergency functionality in the event of a power loss.
Verification Method	Test by measuring time

Verification Procedure	Test by disconnecting wall power to dispatcher ATRMS console, and ensure a minimum of 60 minutes functionality.
Implementation:	
Comments:	CONSOLE PROVIDED BY CPP. NO POWER BACKUP.
Verification Requirements Met	YES ☐ NO ☐
Signature: NCH	Date: 3/7/9

2.5.4	OBS_administration_ATRMS
EDAPTS Specification Identifier	6.2.1.1
Metric Requirement	The ATRMS consoles shall have the capability to allow the user to remotely administer the On-Board Systems aboard each vehicle.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure functionality.
Implementation:	INSPECTED CONSOLE
Comments: [Duplicate testing done in 2.2.4.16]	FUNCTIONALITY NOT IMPLEMENTED, BUT MAY NOT BE ENTIRELY NEEDED IN A SERVICE-BASED MODEL
Verification Requirements Met	YES ☐ NO ☒
Signature: NCH	Date: 2/2/9

2.5.5	schedule_builder_ATRMS
EDAPTS Specification Identifier	6.3.3.1
Metric Requirement	The ATRMS consoles shall have the capability to allow the user to build a schedule, disseminate it to the fleet, and track the schedule version on each vehicle in the fleet.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure functionality.
Implementation: INSPECTED CONSOLE	
Comments: BUILDER ALLOW CREATE/EDIT OF ROUTES & STOPS, BUT NO ACTUAL SCHEDULE ADHERANCE.	
Verification Requirements Met	YES ☒ NO ☒
Signature:	Date: 2/2/9

2.5.6	emergency_alarm_handling_ATRMS
EDAPTS Specification Identifier	**6.5.6.1**
Metric Requirement	**The ATRMS consoles shall have the capability to receive vehicle emergency alarms, track vehicles with alarms, and log actions taken.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure functionality.

Implementation:

USED CONSOLE TO TEST FUNCTIONALITY

Comments:

RECIEVES ALARMS
CAN TRACK VEHICLES (NO SPECIAL HIGHLITING)
CANNOT LOG ACTIONS TAKEN

Verification Requirements Met	**YES** ☒	**NO** ☐
Signature: NBell	**Date:** 2/3/9	

2.5.7	emergency_planning_ATRMS
EDAPTS Specification Identifier	6.5.6.2
Metric Requirement	The ATMS consoles shall have the capability to guide users through the process of creating an emergency plan for handling driver's emergency alarms. This plan shall inlcude procedures for interacting with local law enforcement and forms for developing an emergency callout list.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure functionality.
Implementation: INSPECTED CONSOLE.	
Comments: NO EMERGENCY PLANNING IMPLEMENTATION.	
Verification Requirements Met	YES ☐ NO ☒
Signature: [signature]	Date: 3/7/9

2.5.8	audibility_emergency_ATRMS
EDAPTS Specification Identifier	**6.5.7.1**
Metric Requirement	**The ATRMS shall sound an audio alarm of at least the specified volume at 1 meter.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure an 85dB alarm using a decibel meter at the specified distance.
Implementation: TESTED CONSOLE	
Comments: NO ALARM SOUNDED	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 2/3/9

2.5.9	visibility_emergency_ATRMS
EDAPTS Specification Identifier	6.5.7.2
Metric Requirement	The ATRMS shall have a visual emergency indicator that flashes and attracts the attention of any employee within the room the ATRMS is installed in.
Verification Method	Verify in system design document or specifications. Test installation to ensure compliance.

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure functionality.
Implementation: TESTED CONSOLE	
Comments: NO INDICATORS PRESENT	
Verification Requirements Met	YES ☐ NO ☒
Signature: [signature]	Date: 2/3/19

2.5.10	RID_administration_ATRMS
EDAPTS Specification Identifier	**6.6.9.1**
Metric Requirement	**The ATRMS consoles shall have the capability to allow the user to administer each Dynamic Roadside Information Display in the system, including downloading schedules and executables, operational status, and tracking file versions on each sign.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure functionality.
Implementation: INSPECTED CONSOLE	
Comments: NO ADMINISTRATIVE FUNCTIONALITY [Duplicate testing done in 4.2.3.1]	
Verification Requirements Met	YES ☐ NO ☒
Signature:	**Date:** 2/2/9

2.5.11	time_reporting_accuracy_ATRMS_display
EDAPTS Specification Identifier	6.8.15.1
Metric Requirement	Time estimates shall be accurage within the specified number of seconds.
Verification Method	Test deliverables to ensure complinace or inspect supplied certifications

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console by using radio or cellular communications to confirm a minimum of 30 second accuracy with a partner in the field.
Implementation: COMPARED RECORDED SIGN ACCURACY DATA WITH CONSOLE DATA	
Comments:	
Verification Requirements Met	YES ☒ NO ☐
Signature: NEH	Date: 2/3/9

2.5.12	network_connectivity_central_site
EDAPTS Specification Identifier	**7.2.1.1**
Metric Requirement	**If utilizing TCP/IP communication, ATRMS clients shall function from within a Network Address Translation (NAT) network.**
Verification Method	**Verify in system design document or specifications. Test installation to ensure compliance.**

Verification Procedure	Review design documentation provided by Syncromatics. Set up a dispatcher ATRMS console in a NAT environment and test to ensure functionality.

Implementation:

TESTED CONSOLE BY ACCESSING WEBSITE FROM 4 DIFFERENT NETWORK LOCATIONS, 2 FROM BEHIND NAT.

Comments:

CONSOLE IS WEB-BASED - LIKELY NO PROBLEMS.

Verification Requirements Met	**YES** ☒ **NO** ☐
Signature: Neil	**Date:** 3/7/9

2.5.13	reliability_ATRMS_Comm
EDAPTS Specification Identifier	7.3.2.1
Metric Requirement	The ATRMS Communications System shall meet or exceed the specified successful delivery percentage rate for all data transported between the ATRMS and the ATRMS API.
Verification Method	Test by measuring delivery rate

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console to ensure a 99.99% delivery communications rate.

Implementation:

INSPECT CONSOLE AND OPERATED VARIOUS FUNCTIONS.

Comments:

[May not be necessary for Pomona installation]

APPEARS TO BE 100%

Verification Requirements Met	YES ☒ NO ☐

Signature:	Date:
	2/2/9

2.5.14	latency_ATRMS_Comm
EDAPTS Specification Identifier	7.3.2.2
Metric Requirement	Maximum time for a message and response between the ATRMS and the CSS.
Verification Method	Test by measuring time delay

Verification Procedure	Review design documentation provided by Syncromatics. Test dispatcher ATRMS console by performing simple request actions from the console.

Implementation:

INSPECTED AND OPERATED CONSOLE.

Comments:

MOST FUNCTIONS TAKE LESS THAN A SECOND

Verification Requirements Met	YES ☒ NO ☐

Signature: NOH	Date: 2/2/9

CAL POLY POMONA

Xudong Jia
Cal Poly Pomona
3801 West Temple Avenue
Pomona, California 91768

February 11, 2009

Josh Bigelow
Syncromatics Corporation
8350 Santa Monica Boulevard, Ste. 108
Los Angeles, CA 90069

Dear Mr. Bigelow,

On behalf of Cal Poly Pomona I would like to thank you for the tireless efforts of both you and your team in getting the system and the dynamic messaging signs operational for the ribbon-cutting ceremony on January 8, 2009. Your dedication helped to make that day a resounding success. As the system is now fully operational we have begun our 60-day research evaluation period as described in our contract. As par t of this effort we have been verifying the metrics laid out in the EDAPTS Performance Specification and validating the operation scenarios as described in the Operations Descriptions, exhibits A and C respectively of the Bronco Express Request for Proposal.

A number of questions have arisen out of this validation and verification effort – some of which were anticipated given the service-based business model employed in this deployment and others that have become apparent during this evaluation process. We have opted to assemble these questions together in this letter in the hopes that their delivery as a group will both simplify the process of responding to our inquiry and reduce the time required by you and your staff to answer them.

Thank you for your assistance in this matter.

Sincerely,

Xudong Jia

Cc: Debra Garr, Jeff Gerfen, Neil Hockaday

Questions for Syncromatics

1. Will a User's Manual be provided for the system that includes instructions for regular operations and provides troubleshooting steps to identify solutions for common issues? Questions that have already been identified are as follows:

    a. What are the steps for Cal Poly Pomona to diagnose a failed MDT or other onboard hardware?

    b. What are the steps for Cal Poly Pomona to diagnose a failed Transit Sign?

    c. What are the steps that should be taken if the system map is not displaying any information?

    d. What are the steps that should be taken if all web interfaces and Transit Signs are not displaying information?

2. Will a System Manual be provided describing high-level operations, required regular maintenance operations, and wiring diagrams for installed hardware?

3. If an issue occurs in either the onboard hardware or Transit Sign that causes it to cease operation, are any notifications of the failure provided via the web-based dispatcher console? Are these failures logged, either on the device itself or by your server software?

4. In the event a hardware failure has been determined, which party (Cal Poly Pomona or Syncromatics) is responsible for the removal of the failed unit and installation of the replacement?

    a. In the event the responsibility falls to Cal Poly Pomona, will detailed installation and removal instructions (including test procedures) be provided?

    b. Will Return-to-Vendor (RTV) paperwork be provided to return failed parts?

5. If a Transit Sign is no longer receiving updates due to a failure or communications error, does it display an Out of Service message to riders?

6. Do all field-installed interface wires and cables (e.g. component power and inter-connect cables) conform to applicable state and federal DOT standards for mobile installations, and applicable SAE standards for roadside installations?

    a. Does all installed onboard hardware conform to applicable state and federal DOT standards?

7. Can you provide documentation detailing the messaging requirements for the interface to the Automatic Passenger Counter?

8. Internal to your system, do you initialize to null values all data variables, types, or structures upon creation or when recording an out-of-range value?

9. Does the Mobile Data Terminal have the capability to log position data and boarding / alighting data for later retrieval, such as in the event of a communications outage or failure?

10. Does the Mobile Data Terminal have the capability to survey stops along a route for latitude, longitude, and heading for route creation within the system?

11. What is the duration of autonomous capability of the hosted central server in the event of power loss?

12. Do the Mobile Data Terminals have the ability to conduct self-test diagnostics and display the results to a user, either at installation or remotely?

13. Do the Transit Signs have the ability to conduct self-test diagnostics and display the results to a user, either at installation or remotely?

14. What steps have you taken ensure that communications between the hosted central software and the onboard hardware, transit signs, and dispatch console(s) are resistant to attacks, snooping, or other unauthorized uses?

15. What are the operating temperatures and humidity ranges for installed onboard and roadside equipment?

    a. Can you certify that all elements of the system installed or exposed to an outdoor environment is weather resistant?

    b. Can you certify that all elements are resistant to the levels of electro-magnetic interference (EMI) present in their installed environments?

16. What is the expected operation lifecycle for onboard and roadside equipment?

    a. Can you provide mean-time-between-failure (MTBF) estimates for the above equipment?

    b. What is considered to be the acceptable level of uptime of the above equipment under normal conditions?

17. What methods are utilized to assure time synchronization between all devices and clients within the system?

18. Can you describe the extensibility capabilities of the onboard hardware for possible future additions and feature upgrades? For example, could the MDT be updated with the capability to control an on-board annunciator or electronic sign to notify passengers upon arrival at a stop?

19. Do any of the devices or software make use of the EDAPTS Data Formatting Standard as laid out in Exhibit B of the Bronco Express Request for Proposal?

20. What are the storage capabilities (e.g. how many months or years of data) of the hosted central software?

    a. Can you describe the backup processes taken to ensure data retention?

21. What is the level of power consumption for the onboard MDT and communications equipment?

22. For solar-powered Transit Signs, what is the duration of solar autonomy? Batteries should not drop below 50% capacity to achieve this estimate.

23. For solar-powered Transit Signs, what is the recovery duration for a sign at a 50% capacity battery level to recover to 90% capacity?

24. Once a Transit Sign has received a message from the central software, how long does it take to process and display the message?

25. Will a Traveler Information API be made available to allow for other devices and services to utilize the position and stop data collected by your system?

26. Can you certify that all installed onboard or roadside parts and hardware meet FCC guidelines and meet MIL-STD-461 tolerances for radiated emissions?

27. Can you certify that all systems utilizing wireless transmissions have been licensed (as necessary) by the FCC?

28. Can you certify that all onboard or roadside parts and hardware are compliant with the California Electronic Waste Recycling (EWRA) Act of 2003?

29. Can you certify that that the components or hardware required for powering the non-solar-powered Transit Sign are Underwriters Laboratories (UL) listed?

30. Can you certify that messaging displayed by the Transit Signs are conformant to the Americans with Disabilities Act (ADA) Standards for Accessible Design, 28 CFR Part 36?

Syncromatics Corporation
8350 Santa Monica Blvd
Suite 108
West Hollywood, CA 90069
(310) 728-6997
info@syncromatics.com

March 3, 2009

Dr. Xudong Jia
Cal Poly Pomona
3801 West Temple Avenue
Pomona, CA 91768
xjia@csupomona.edu

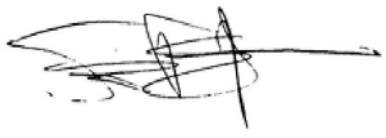
Dear Xudong:

Our first year doing business together has been a rewarding experience for both of us. We share your excitement about the EDAPTS deployment, particularly with respect to our collective achievement with the solar-powered transit signs.

Attached please find the answers to the questions posed to us in your letter of 11 February 2009, requesting clarification on certain points of the validation plan. If you require any further information please don't hesitate to contact us.

I look forward to many more years of success with the EDAPTS program and future deployments nationwide.

Best Regards,



Josh Bigelow,
President & CEO
josh@syncromatics.com

1. Yes
    a. See the MDT system user manual
    b. See the Solar Sign user manual
    c. See the AVL user manual
    d. Syncromatics engages proactive monitoring of all our connected services including vehicle equipment, signs and the web portal; it is unlikely that Cal Poly will notice a systemwide failure before Syncromatics will. A systemwide failure such as this is a level 1 issue and Syncromatics will respond within minutes 24x7. Further, if any vehicle, sign or web interface is out of order Cal Poly personnel should contact us immediately.
2. Yes. See the attached user manuals
3. Yes. Timestamps are recorded for the last time a device reported to the servers, and more detailed failure logs are kept on the devices as well. If the device / vehicle is in operation but the timestamp has not been updated, then there may be a problem.
4. Basic debugging and component replacement is expected of Cal Poly Pomona. Syncromatics will work with you to diagnose any issues and resolve the problem. If it is determined that a single device replacement cannot solve an issue, Syncromatics will be on site to fix this issue.
    a. Yes. See the respective user manuals.
    b. If requested, Syncromatics can supply RMA paperwork
5. If the button is pressed the sign will announce that it is not in service and is having technical difficulties, and will announce a numerical diagnostic code to be relayed to Syncromatics. However, the sign does not display the out of service message on the LED to conserve power.
6. Yes, all hardware including cables and interconnects is compliant with state and federal standards. Specifically: SAE J1455, ISO 7637-2:2004, RoHS, and various FCC codes.
    a. Yes, see (6).
7. Yes, the APCs operate on the IBIS protocol – documentation on the format is freely available online.
8. Not always, it depends on the specific data structure. We have nullable values on many database records and all our memory-based data structures support and sometimes utilize nullable values.
9. Passenger counts are temporarily stored by the door slave (see the APC user manual). In the event of a modem failure, the door slave will store the counts until the modem is reconnected.
10. Stops can be surveyed by opening the door (if the APC system is installed) at each location. This will provide a GPS location of when the door was opened and can be used for detailing stops.
11. Our collocation provider advises us there is 30 days of autonomous power supply via generators. Our servers are located immediately adjacent to One Wilshire, the largest communications hub in the Western United States.
12. Yes MDTs have both remote diagnostics by administrative users and also local diagnostics with the administrative password.

13. Yes, solar signs have both remote diagnostics by administrative users and also local diagnostics when plugged in. via USB. They also monitor and report battery voltage.

14. .The devices only accept data from whiltelisted hosts (e.g. its reporting server) and are behind an implicit NAT firewall. The reporting servers are heavily protected by Cisco firewalls.

15. Fully functional -30C to +70C, reduced capability to -40C and up to +85C. 95% RH @ 50C non condensing.

    a. Outdoor components (solar sign) are placed inside of a waterproof enclosure.

    b. Yes, devices conform to the EN61000-4-3 standard for EMI resistance.

16. Expected operation approximately four years.

    a. MTBF approximately 5 years.

    b. Estimated: 99%.

17. Every time the device boots it accepts time synchronization from its parent server which is synchronized with US Navy atomic clock servers.

18. The core of the AVL system is a highly programmable device with numerous ports for addons in the system. The device can support six digital inputs, SAE J1708, up to eight USB devices (including RS232 expansion ports), one RS232 natively. It also has low-side digital outputs, an accelerometer, and Bluetooth. It runs Windows CE.

19. No.

20. Twelve months of data for stop records and vehicle data is kept in an immediately accessible database. Beyond that, data is moved to archive database for performance reasons. Data can be retrieved from this database upon request.

    a. Backup is performed to two local backup drives twice daily, and uploaded to an offsite remote backup service once weekly. All servers have hardware RAID.

21. MDTs require about 12 watts. The AVL system requires about 3-4 watts. The APC system requires 3-4 watts.

22. Solar autonomy is estimated at 5-6 days (when the solar panel is disconnected. Even during the worst conditions, the solar panel still generates about 10% of its peak power).

23. Estimated 8 days to recharge the battery from 50% capacity to 90% (assuming all electronics are operating during this recharge time).

24. Messages sent from the central server should be displayed within 1-2 seconds.

25. XML feeds are already in place as the underlying data transmission standard; any user can use browser plugins to access the data.

26. FCC guidelines yes, MIL-STD-461 no, but it does meet a similar standard **EN61000-4-3.**

27. Yes.

28. The equipment provided is not considered hazardous waste under EWRA and is thus compliant.

29. We have not developed non-solar-powered signs and as such have not yet chosen equipment for that. It would certainly be UL listed if we did though.

30. To the best of our knowledge, the solar signs should be compliant with ADA requirements.

EDAPTS

Smart Transit System

Task Order 6403

Cal Poly Pomona EDAPTS Test Deployment

System Validation Plan

Version 0.1

Prepared for

California Partners for Advanced Transit and Highways

California Department of Transportation

Prepared by

Xudong Jia, Ph.D., P.E

Ryan Beasley

California State Polytechnic University, Pomona

And

Jeff Gerfen

Neil Hockaday

California Polytechnic State University, San Luis Obispo

Under PATH Contract TO 6403

September 2008

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1. INTRODUCTION

The system validation plan will demonstrate that system operational scenarios may be successfully demonstrated. Operational scenarios are divided into these six categories:

1. Riding the Bronco Express Shuttles
2. Driving the Bronco Express Shuttles
3. Dispatching Drivers and Vehicles
4. Managing Bronco Express Services
5. Laidlaw Management Tasks
6. Maintaining the EDAPTS System

2. SUMMARY OF VALIDATION TESTS

Please use the following table to document the successful completion of all validation tests.

RIDING THE BRONCO EXPRESS SHUTTLES		
Operational Scenario	**Completion**	**Date Tested**
3.1.1 CPP professor walks up to a bus stop to catch a bus	Pass / Fail / Not Validated	1-13-09
3.1.2 CPP Student in the library needing to catch a bus	Pass / Fail / Not Validated	1-13-09
3.1.3 CPP Student with a cell phone needing to catch a bus (Potential future feature)	Pass / Fail / Not Validated	1-13-09
3.1.3A CPP Student with a cell phone needing to catch a bus	Pass / Fail / Not Validated	3-3-09
3.1.4 CPP Student with a web-enabled cell phone needing to catch a bus (POSSIBLE FUTURE FEATURE)	Pass / Fail / Not Validated	1-15-09

DRIVING THE BRONCO EXPRESS SHUTTLES		
Operational Scenario	**Completion**	**Date Tested**
3.2.1 Cal Poly or Laidlaw driver starting the day's work	Pass / Fail / Not Validated	1-21-09
3.2.2 Cal Poly or Laidlaw driver changing shift	Pass / Fail / Not Validated	1-22-09
3.2.3 Cal Poly or Laidlaw driver logout	Pass / Fail / Not Validated	1-22-09
3.2.4 Cal Poly or Laidlaw driver on route and picking up passengers	Pass / Fail / Not Validated	1-27-09
3.2.5 Cal Poly or Laidlaw driver on route and picking up passengers with automatic passenger counter (APC) (POSSIBLE FUTURE FEATURE)	Pass / Fail / Not Validated	1-27-09

3.2.6 Dangerous situation on bus	Pass / Fail / Not Validated	2-5-09
3.2.7 Going on break	Pass / Fail / Not Validated	1-27-09
3.2.8 Fueling	Pass / Fail / Not Validated	1-29-09

DISPATCHING DRIVERS AND VEHICLES		
Operational Scenario	**Completion**	**Date Tested**
3.3.1 Dispatchers at work	Pass / Fail / Not Validated	1-29-09
3.3.2 Dispatchers know where vehicles are	Pass / Fail / Not Validated	1-29-09
3.3.3 Dispatch bus with serious mechanical failure	Pass / Fail / Not Validated	1-29-09

MANAGING BRONCO EXPRESS SERVICE		
Operational Scenario	**Completion**	**Date Tested**
3.4.1 Using passenger loading reports to optimize vehicle size	Pass / Fail / Not Validated	1-29-09
3.4.2 Using schedule adherence reports to adjust schedule (Potential future feature)	Pass / Fail / Not Validated	1-30-09

LAIDLAW MANAGEMENT TASKS		
Operational Scenario	**Completion**	**Date Tested**
3.5.1 Providing the monthly report to Cal Poly	Pass / Fail / Not Validated	1-30-09

MAINTAINING THE EDAPTS SYSTEM		
Operational Scenario	**Completion**	**Date Tested**
3.6.1 Schedule and route updates	Pass / Fail / Not Validated	2-5-09

3.6.2 Addition of new stops on a route	Pass / Fail / Not Validated	2-5-09
3.6.3 On-board Hardware Maintenance	Pass / Fail / Not Validated	3-9-09
3.6.4 Dispatch Console Maintenance	Pass / Fail / Not Validated	3-9-09
3.6.5 Vehicle to central dispatch communication link fails	Pass / Fail / Not Validated	3-9-09
3.6.6 On-board equipment fails	Pass / Fail / Not Validated	3-9-09
3.6.7 Transit sign fails	Pass / Fail / Not Validated	3-10-09
3.6.8 Computer console or server fails	Pass / Fail / Not Validated	3-10-09

3. VALIDATION WORKSHEETS

3.1 Riding the Bronco Express Shuttles

3.1.1 CPP PROFESSOR WALKS UP TO A BUS STOP TO CATCH A BUS

DATE: 1-13-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.1.1):

A professor walks up to a bus stop at 15 minutes before the hour to get a ride to his class. He knows that buses serving Routes A, B, and C pass through this stop, however he would like to catch Route B. He is not too concerned about being late to his class, since he knows the Route B bus is scheduled to arrive at the stop 12 minutes before the hour and will drop him off at his lecture destination at 3 minutes before the hour. This would allow him to be in his class by 1 minute after the hour and ready to teach at 10 minutes after.

The *Bronco Express Automatic Transit Arrival Sign* installed at the bus stop provides him with information for all routes by successively displaying the following messages:

Rt A here in 10 minutes

Rt B here in 4 minutes

Rt C OUT OF SERVICE

Each message is displayed for approximately 7 seconds, then the pattern repeats.

The professor notes Route B is running a minute late, but feels comfortable since the information displayed on the Bronco Express EDAPTS bus sign has demonstrated itself to be accurate. He also notes that Route C is not running and wonders if it is because the bus has had a mechanical failure or the driver is on break. He knows these are the most probable explanations because he read the promotional material distributed via email and in the CPP campus newspaper, Poly Post, when the new EDAPTS system was installed.

The Route B bus arrives as predicted at 11 minutes before the hour, the professor boards and the bus departs. The bus ends up gaining a little time on the way to his destination and arrives on schedule at 3 minutes before the hour.

The professor gets off the bus, walks to his classroom, and is on time.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a bus schedule.
2. The *Bronco Express Automatic Transit Arrival Sign* provides bus information for all routes, such as arrival times and "out of service" announcement.
3. The system shall constantly update the shuttle arrival times on the *Bronco Express Automatic Transit Arrival Sign* every 7 seconds.
4. Promotional material for EDAPTS system shall be provided.

VALIDATION PLAN

1. Create a data collection sheet (or map) that chronicles and details the professor's (tester's) arrival at the initial bus stop, wait for the bus, ride on the bus, arrival at the last bus stop and walk to his final destination.
2. Take the planned trip, noting all times on the data collection sheet.
3. Record observations about other factors and impressions. Required observations are:
    - Did the system provide a bus schedule?
    - Did the *Bronco Express Automatic Transit Arrival Sign* provide bus information for all routes?
    - Did the shuttle arrival times on the *Bronco Express Automatic Transit Arrival Sign* update every 7 seconds?
    - Was promotional material for EDAPTS system provided?

NOTES

I arrived at the CLA Building Shuttle Stop at 10:30 AM. This stop serves both Route A and Route B. The only schedule for the buses is that a bus will arrive every 10-15 minutes. There is no stop that serves Route A, Route B, and Route C.

When I arrived at the stop the Bronco Express Automatic Transit Arrival Sign displayed the following:

Bus Arrival Times:
Route B-2 : Bus in 15 min
Route A : Bus in 3min, 9min

The route information scrolled from right to left, displayed for approximately 7 seconds and

then updated.

The bus arrived at 10:34 AM. I boarded the Route A bus because I knew that it linked to the Environmental Design building.

I departed the bus at 10:47 AM at the Environmental Design building stop.

There was information provided about the release of the new EDAPTS system in the Poly Post.

The information explained the new features of the system and how it will help the campus.

VALIDATION RESULTS

Did the system provide a bus schedule?

YES ☐ NO ☑ N/A ☐

Explain: The only schedule provided was that the shuttles arrive at the bus stop every 10-15 minutes.

Did the *Bronco Express Automatic Transit Arrival Sign* provide bus information for all routes?

YES ☑ NO ☐ N/A ☐

Explain: Both Route A and Route B shuttle information was displayed on the Bronco Express Automatic Transit Arrival Sign

Did the shuttle arrival times on the *Bronco Express Automatic Transit Arrival Sign* update every 7 seconds?

YES ☑ NO ☐ N/A ☐

Explain: Arrival times were displayed in a timely manner scrolling from right to left. Each route arrival time was displayed for approximately 7 seconds and would rotate between the routes.

Was promotional material for EDAPTS system provided?

YES ☑ NO ☐ N/A ☐

Explain: Promotional Material for the EDAPTS system was provided in the Poly Post Vol. LXIV NO. 12 (Tuesday, January 13, 2009)

Was the operational scenario (3.1.1 CPP PROFESSOR WALKS UP TO A BUS STOP TO CATCH A

BUS) successfully completed?

YES ☑ NO ☐ N/A ☐

Explain: The tester (professor) was able to walk up to a bus stop, see the time a bus would be arriving and was able to catch the bus in a timely manner. Since the Bronco Express did not have a schedule the scenario was a bit different. We could not say that the bus would arrive at a specific time or drop of a passenger at a certain time. If the Bronco Express did have a schedule this scenario would have been flawless. If a schedule like the one in the scenario existed the rest of the operational characteristics would still be valid.

What worked?

The characteristics of the Bronco Express Automatic Transit Arrival Sign.

What didn't work?

Since there was not a bus schedule provided, the exact times of bus arrivals and departures could not be determined. Instead we had to use the frequency of the buses for each route.

3.1.2 CPP STUDENT IN THE LIBRARY NEEDING TO CATCH A BUS

DATE: 1-13-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.1.2):

A student is studying with a classmate in Building 17 (Engineering Building) and it is getting late. She needs to catch the Bronco Express home to the University Village housing complex but wishes to study for as long as is possible without missing the bus.

She checks the Bronco Express website and determines that Route A, which will take her to the Village, will be stopping in front of Building 17 at 10:45 PM. The Internet-based display also shows which buses are out of service, so she knows what all of her bus riding options are before packing up and heading to the bus stop. The student can see that Route A is on route and on schedule and indeed will be available to ride.

The student packs up her books at 10:35 PM, walks outside, and arrives at the Building 17 bus stop at 10:40PM. The large-format Bronco Express Automatic Transit Arrival Sign installed in front of Building 17 indicates that Route A will be arriving in 5 minutes, which makes her feel comfortable. It seems to her that more people are riding the bus; maybe because they have higher confidence getting a ride when they need it. This is also good news because students are driving less and that helps reduce traffic congestion on campus.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall present arrival time and updates of bus status (out of service/on route and on schedule) on the website.

2. Large-format Bronco Express Automatic Transit Arrival Sign displays estimated bus arrival time.

VALIDATION PLAN

1. Plan a trip that can simulate the student's (tester's) attempt to catch a bus from Building 17 to the University Village

2. Create a data collection sheet (or map) that chronicles and details the student's (tester's) activities including checking the Bronco Express website to establish bus arrival time at a planned originating stop, arriving at the planned bus stop and waiting for the bus.

3. Take the planned trip, noting all times on the data collection sheet.

4. Record observations about other factors and impressions. Required observations are:
    - Was the bus arrival time available on the web?
    - Was the student able to see the bus status (out of service/on route and on schedule) on the web?
    - Did the large-format Bronco Express Automatic Transit Arrival Sign display estimated bus arrival time?

NOTES

Instead of using building 17 I used Building 9. Also, there is no Building 17 Shuttle Stop so I used the Building 94 Shuttle Stop. There are no large-format Bronco Express Automatic Transit Arrival Signs at Cal Poly Pomona.

From one of the computer labs in Building 9 I went to www.broncoshuttle.com to view the shuttle arrival information.

The first observation that I made was that it showed every route and it also showed that route B-1 was not running.

At 1:57 PM I viewed the shuttle information for Route A and hovered my mouse over the Building 94 stop and obtained the following information:

Building 94
Served By:
Route A, Route B-1,
Route B-2
Next Vehicle Arriving:
247 in 5 min, 199 in 17min

I left building 9 and arrived at the Building 94 Shuttle Stop at 1:59 PM.

When I got there the Bronco Express Automatic Transit Arrival Sign displayed the following:

Arrival Times
Route B-2 : Bus in 14min
Route A : Bus in 4min, 16min

The bus arrived at 2:03 PM and I boarded the bus. I departed the bus at the University Village shuttle stop at 2:13 PM

VALIDATION RESULTS

Was the bus arrival time available on the web?

YES ☑ NO ☐ N/A ☐

Explain: I was able to find shuttle arrival information for each route.

Was the student able to see the bus status (out of service/on route and on schedule) on the web?

YES ☑ NO ☐ N/A ☐

Explain: Not only was I able to view all the shuttle arrival information for all routes but I was also able to see if a shuttle was currently not running.

Did the large-format Bronco Express Automatic Transit Arrival Sign display estimated bus arrival time?

YES ☐ NO ☐ N/A ☑

Explain: There is no large-format Bronco Express Automatic Transit Arrival Sign, but the Bronco Express Automatic Transit Arrival Sign that was at the Building 94 Shuttle Stop did display the estimated bus arrival time.

WAS THIS OPERATIONAL SCENARIO (3.1.2 CPP STUDENT IN THE LIBRARY NEEDING TO CATCH A BUS) SUCCESSFULLY COMPLETED?

YES ☑ NO ☐ N/A ☐

Explain: I was able to view the shuttle arrival information online at www.broncoshuttle.com. I was also able to view the shuttle arrival information displayed by the Bronco Express Automatic Transit Arrival sign which did make me feel comfortable about the arrival of the bus.

What worked?

The shuttle arrival information was available via the web.
The Bronco Express Automatic Transit Arrival Sign displayed the estimated bus arrival time.

What didn't work?

There was no Large-format Bronco Express Automatic Transit Arrival Sign.

3.1.3	CPP STUDENT WITH A CELL PHONE NEEDING TO CATCH A BUS (POTENTIAL FUTURE FEATURE)
DATE: 1-13-09	**TESTER(S):** Ryan Beasley
FACILITATOR(S):	

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.1.3):

A student desiring to catch Route C from the Library dials the *Bronco Express Ride Hotline*. The call received by a voicemail system requests the stop number he wants to catch the bus at.

He looks up the stop number on his quick-reference laminated card he keeps in his wallet and enters it. The voicemail system responds in a pleasing voice:

Route C here in 20 minutes.

The student notices that the entire transaction takes only about 20 seconds, as the voicemail system is quick in both its request for stop number, and its response back to the student.

The student decides that he has enough time to get a bite to eat and catch Route C in 20 minutes. He picks up lunch and heads to the Library bus stop 15 minutes later, where the sign indicates that Route C will be arriving in 5 minutes. The student boards the shuttle and is on his way.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a voicemail system to help riders catch buses.
2. Quick-reference laminated card shall be provided.
3. The system shall provide the bus arrival times by voicemail.
4. Voicemail transaction time shall be about 20 seconds. (i.e. more than 15 seconds and less than 30 seconds)
5. Bronco Express Automatic Transit Arrival Sign displays estimated bus arrival time. (Previously validated, see Section 3.1.1)

VALIDATION PLAN

1. Develop a voicemail conversation plan to simulate the student's (tester's) conversation,

transaction time and bus wait time.

2. Create a data collection sheet (or map) that chronicles and details the student's (tester's) activities including dialing or messaging the Bronco Express Ride Hotline, arriving at the planned bus stop and waiting for the bus.

3. Conduct the conversation plan, noting all transaction times on the data collection sheet.

4. Record observations about other factors and impressions. Required observations are:

    - Was the *Bronco Express Ride Hotline* available?
    - Was a quick-reference laminated card available?
    - Did the voice system respond with the bus arrival information?
    - Was the transaction time more than 15 seconds and less than 30 seconds (i.e. =20+10/-5)?

NOTES

This scenario was not tested because the contractor did not provide a voicemail service. They provided a different service that was similar to the voicemail service. We tested this scenario using their text messaging service in section 3.1.3A.

VALIDATION RESULTS
Was the *Bronco Express Ride Hotline* available? YES ☐ NO ☐ N/A ☑ Explain: Not validated.
Was a quick-reference laminated card available? YES ☐ NO ☐ N/A ☑ Explain: Not validated.
Did the voice system respond with the bus arrival information? YES ☐ NO ☐ N/A ☑ Explain: Not validated.
Was the transaction time more than 15 seconds and less than 30 seconds (i.e. =20+10/-5)? YES ☐ NO ☐ N/A ☑ Explain: Not validated.
Was the operational scenario (3.1.3 CPP STUDENT WITH A CELL PHONE NEEDING TO CATCH A BUS [POTENTIAL FUTURE FEATURE]) executed successfully? YES ☐ NO ☐ N/A ☑ Explain: Not validated.
What worked? N/A
What didn't work? N/A

3.1.3A CPP STUDENT WITH A CELL PHONE NEEDING TO CATCH A BUS

DATE: ~~1-29-09~~ 3-5-09 **TESTER(S):** Ryan Beasley

FACILITATOR(S):

INTRODUCTION

The system does not provide the Bronco Express Ride hotline. Instead it provides a similar service, text message system, which will be tested. This text messaging service will start out with one initial text message sent by the tester. The initial text message involves sending the text "pomona" to the number (213) 400-3484. After this initial text message is sent the system responds with steps on how to send other messages to find an exact stop.

The text messaging system also allows you to store your stop. For this scenario we will replace the quick-reference laminated card with the "stop-store" feature provided by the system. In the scenario the student wants to catch Route C from the Library, but there is no stop at the Library. The stop will be changed to the Campus Center Marketplace.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a text messaging system to help riders catch buses.
2. The system shall provide the bus arrival times via a text messaging system.

PROCEDURES:

Knowing the destination the tester will already be waiting at the Campus Center Marketplace. The tester will first store the stop in his phone. The tester will record how long it takes to store the stop into the phone.

Once the stop is stored the tester will send the required text message to see when the next bus for Route C will arrive at the Campus Center Marketplace. The tester will first record the time the message was sent. The tester will record what the system writes in the text message, including the time the message was sent and the time the next bus for Route C will arrive at the Campus Center Marketplace.

The tester will then wait for the Route C bus to arrive at the Campus Center Marketplace. The tester will record the time the bus arrives. Knowing the predicted bus arrival time, the time the last text message was received and the time the bus arrived, the tester can verify if the bus arrived at the predicted arrival time.

NOTES

When this alternative validation plan was created the contractor provided this text messaging feature. As of today this feature is not available.

I remember using this feature before and it being very useful. I would text "Pomona" to (213) 400-3484 and I would get back a message asking me to choose a route. I would message back saying A, it would then ask me to type in a number for what stop I wanted to know the arrival time. Once I messaged back number corresponding to the stop I wanted it would tell me the arrival time.

It also had a feature that would allow me to save the specific route and stop I wanted. The total text messaging did not take more than 2 minutes and if I had a stored stop it took like than 45 seconds. Since this feature is not available at this time it could not be used for the scenario.

When I went to mobile features section of www.broncoexpress.com the following message was given in regards to the text messaging service:

> *Many of you really enjoy our text (SMS) service. We are working on a cost-effective way to offer this to the public, but as you know SMS is not free. It's in the works and we'll post information here as we have it.*

This scenario was retested on 3-5-09.

The service became available on February 26th. The service is a little bit different than what they had in the past because the contractor now has a different provider.

I started out at the Environmental Design Building desiring to catch Route B-2. I sent the text message "calpoly 27" to the number 41411 at 10:18:00AM. I received the following response at 10:18:10AM:

> *@10:18AM*
> *Route B-2 @ College of Environmental Design:*
> *----*
> *071 in 23 min*
> *----*
> *Rply same msg to refresh*

There was no sign installed at this stop so I decided to wait 15 minutes and then send another text message to confirm the arrival time. I once again sent "calpoly 27" to 41411 at 10:33:00AM and received the following response ten seconds later:

> *@10:33AM*
> *Route B-2 @ College of Environmental Design:*
> *----*
> *071 in 9 min*
> *----*

Rply same msg to refresh

The Route B-2 Bus #071 arrived at the Environmental Design Building Stop at 10:40AM.

The store-stop feature is no-longer available with the new text messaging service. The website www.broncoshuttle.com provided the stop numbers in the mobile features section. From the numbers that were provided on this website I made a quick reference card. Each stop for every route had its own stop number. If a stop shared a route each route had a different number for that stop.

VALIDATION RESULTS
Was the text messaging service available? YES ☑ NO ☐ N/A ☐ Explain: The text messaging service was available.
Was the tester able to store the desired stop? YES ☐ NO ☑ N/A ☐ Explain: This feature was not available with the new text messaging service, but it was very easy to create a quick reference card which was where this question originated.
Did the test messaging system respond with the bus arrival information? YES ☑ NO ☐ N/A ☐ Explain: The text messaging system responded with bus arrival information.
Was the transaction time more than 15 seconds and less than 30 seconds (i.e. =20+10/-5)? YES ☑ NO ☐ N/A ☐ Explain: The transaction time was 10 seconds.
Did the bus arrive at the predicted arrival time? YES ☑ NO ☐ N/A ☐ Explain: The bus arrived less than one minute early that then predicted arrival time.
Was the alternative operational scenario (3.1.3A CPP STUDENT WITH A CELL PHONE NEEDING TO CATCH A BUS) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: The student was able to catch a bus by using the text messaging feature on his/her cell phone. The transaction time only took 10 seconds. The student was able to receive estimated bus arrival times via a cell phone.
What worked?

A text messaging service was available and provided bus arrival information. A quick reference card was available. The transaction time was only 10 seconds.
What didn't work? N/A

3.1.4	CPP STUDENT WITH A WEB-ENABLED CELL PHONE NEEDING TO CATCH A BUS (POSSIBLE FUTURE FEATURE)
DATE: 1-15-09	**TESTER(S):** Ryan Beasley
FACILITATOR(S):	

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.1.4):

A student is exiting a class and wants to catch route B at stop at Kellogg West outside her classroom.

The student uses her web-enabled phone or PDA to access the Bronco Express website. She keys in the stop number and her phone displays the following information compactly on its Web screen.

Route B here in 8 minutes.

The student decides to head to the bus stop and arrives at the stop 3 minutes later. She finds the small-format *Bronco Express Automatic Transit Arrival Sign*, and looks at it, noticing two other students are also looking at the sign. The sign indicates that the Route B shuttle will arrive in 5 minutes.

The sign counts down, finally indicating that the shuttle will be arriving in 1 minute.

Shortly thereafter the shuttle arrives. The student boards the bus and is on her way.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall present shuttle arrival times on the Web and be accessible via PDA or web-enabled phone.
2. The system shall display the bus arrival times on web-enabled phone/PDA.
3. The system shall count down the shuttle arrival times on the small-format *Bronco Express Automatic Transit Arrival Sign*.

VALIDATION PLAN

1. Develop a bus-catching plan to simulate student's (tester's) web navigation and bus wait

time.

2. Create a data collection sheet (or map) that chronicles and details the student's (tester's) activities including using a web-enabled phone or PDA to access the Bronco Express website, arriving at the planned bus stop and waiting for the bus.

3. Conduct the bus catching plan, noting all the protocols involved on the data collection sheet.

4. Record observations about other factors and impressions. Required observations are:

    - Was the website accessible via web-enabled phone or PDA?
    - Was the web-enabled phone or PDA able to access bus arrival information?
    - Was the small-format *Bronco Express Automatic Transit Arrival Sign provided?*
    - Did the sign countdown the bus arrival time?

NOTES

I started at Building 98 (CLA Building). From inside the building I used my mobile phone to go the website www.broncoshuttle.com/mobile.aspx.
The website had the following information provided after the Cal Poly Pomona Logo:

Choose a route to see arrival times for our stops:

- Route A
- Route B-1
- Route B-2
- Route C

- powered by Syncromatics -

I chose Route A and the next page displayed the following information:

Route A

LIVE MAP

Choose a stop to see arrival times:

- University Village
- So Campus/Temple
- Bldg 7 - College of Environmental Design

- Building 94
- Rose Garden
- Bldg. 91/SAITS
- CLA
- Kellogg Circle/Information Booth

- powered by Syncromatics -

I clicked the CLA link and the next page displayed the following information:

Route A
CLA
as of 10:18:52A 1/15

247 in 12 min, 199 in 14 min

refresh

- powered by Syncromatics -

I exited the building and arrived at the CLA stop at 10:22AM.
At this time the arrival sign displayed the following information:

Bus Arrival Times:
Route B-2: bus in 48min
Route A: bus in 8min, 10min

As I waited, the arrival time counted down and at 10:25 AM the sign displayed the following information:

Bus Arrival Times:
Route B-2: bus in 46min
Route A: bus in 3min, 7min

Arrival times continued to countdown until the Route A bus #247 arrived at the CLA stop at 10:27 AM.

VALIDATION RESULTS
Was the website accessible via web-enabled phone or PDA? YES ☑ NO ☐ N/A ☐ Explain: I was able to access the mobile friendly version of www.broncoshuttle.com via my web-enable phone.
Was the web-enabled phone or PDA able to access bus arrival information? YES ☑ NO ☐ N/A ☐ Explain: The website displayed shuttle arrival information on the web-enabled phone.
Was the small-format *Bronco Express Automatic Transit Arrival Sign provided?* YES ☐ NO ☑ N/A ☐ Explain: There was no small-format Bronco Express Automatic Transit Arrival sign, but there was a Bronco Express Automatic Transit Arrival sign.
Did the sign countdown the bus arrival time? YES ☑ NO ☐ N/A ☐ Explain: As the bus got closer to the stop its arrival time decreased.
Was the operational scenario (3.1.4 CPP STUDENT WITH A WEB-ENABLED CELL PHONE NEEDING TO CATCH A BUS [POSSIBLE FUTURE FEATURE]) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: As a Cal Poly Pomona Student with a web-enabled cell phone I was able to catch a bus.
What worked? The bronco shuttle website was accessible via a web-enabled phone and it displayed shuttle arrival information for all routes. The Bronco Express Automatic Transit Arrival sign counted down the arrival times.
What didn't work? There was no small-format Bronco Express Automatic Transit Arrival sign.

3.2 Driving the Bronco Express Shuttles

3.2.1 CAL POLY OR LAIDLAW DRIVER STARTING DAY'S WORK

DATE: 1-21-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S): Parking and Transportation Services

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.1):

A Laidlaw driver arrives at work, and gets all information about the assignments and activities from the operations manager in the Laidlaw yard.

The driver walks out to his bus and powers it up. The *Mobile Data Terminal* in the driver's compartment is automatically powered up at this time and presents a login screen within two minutes.

The driver performs all his start-of-day checks and sits down in the driver's seat. He then selects "Driver Login" from the MDT menu of options, and selects his name from a list of possible drivers it displayed. The MDT automatically retrieves his employee ID from locally stored information on the MDT.

The driver is prompted for the vehicle's odometer reading and he enters it via the MDT's display and keypad. He does not have to enter other information such as date and time because the MDT determines this automatically from its GPS-synchronized internal clock.

The MDT then provides the driver with a list of possible routes, and he selects Route C as assigned by the dispatcher. This completes the login process and the MDT is ready for the driver to begin his route.

The MDT displays the stop where he should begin his route. The driver pulls out of the yard and heads for Cal Poly Pomona.

As soon as the driver reaches a predetermined speed of 5 MPH, the MDT starts displaying time in a large digit format and removes all other information from the display. Removal of detailed schedule adherence information from the MDT display helps prevent the driver from looking at the MDT while the shuttle is in motion. This reduces driver distraction and minimizes unsafe

situations that are caused by inattention to the road ahead.

The driver arrives at Stop 5 or the beginning of Route C and the MDT indicates: "Arrived at Stop 5, departure in 6 minutes". He watches the MDT count down to zero minutes and then begins his route.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The MDT automatically powers up when bus turns on.
2. The MDT displays a login screen within two minutes after the bus is turned on.
3. Drivers can sign on by selecting their employee name from a list of possible drivers.
4. The MDT automatically retrieves employee ID from locally stored information.
5. Driver is prompted for and enters odometer reading at beginning of service (work).
6. The MDT provides a fully functional GPS-synchronized internal clock.
7. Driver is able to select his route from a list of possible routes provided by the MDT.
8. The MDT displays the first stop when the driver begins his route.
9. The MDT displays a large digital format clock and removes all other information after reaching a speed above 5 MPH.
10. The MDT displays automatic countdown until departure for all stops based on actual arrival time and scheduled departure time.

VALIDATION PLAN

1. Monitor the driver's procedures of using MDT to start a day of work.
2. Create a data collection sheet (or map) that chronicles and details the driver's login and MDT performance during vehicle operations.
3. Record observations about other factors and impressions. Required observations are:
    - Was the MDT automatically powered up with bus power up?
    - Was the login screen available within less than two (2) minutes after MDT power up?
    - Was the driver able to login by selecting his employee name?

- Did the MDT automatically retrieve the driver's employee ID from locally stored information?
- Was the driver prompted to input odometer reading?
- Did the MDT provide a fully functional GPS-synchronized internal clock?
- Was the driver able to select a route from a list of possible routes?
- Was the first stop displayed when the driver began his route?
- Was the MDT display automatically changed to show the time-of-day when the speed was over 5 MPH?
- Did the countdown-to-departure feature of the MDT work when the driver arrived at stops?

NOTES

This scenario started out in the middle of a driver's shift, but the driver had not logged into the MDT yet.

The engine was already running but the MDT was not turned on. In order to turn on the MDT the F1 button had to be pressed.

After the F1 button was pressed the MDT powered up and had a main menu in less than 1 minute. In this main menu there are several different features including: emergency button, login menu, messages menu, settings menu, and admin menu.

The driver pressed the login button and the MDT displayed the following message:

Enter your ID number

Under this message was a blank box which the driver had to touch to enter in his ID number. When the driver pressed this box a new screen came up for which he was able to enter in his number by touching the correct numbers. Each bus driver has been assigned their own personal ID number for the MDT.

After the driver entered his ID number he pressed the next key and the MDT displayed the following:

Is this You?
Don Marrolli

Don Marrolli was the driver in this scenario so he pressed the yes key. After pressing the yes key

the MDT displayed the following message:

Which route are you driving?

Under this message was a blank box which the driver had to touch. When the driver touched the blank box a new menu came up in order for him to be able to type his route letter. He entered A and pressed the next button. The MDT displayed the following message

Is this the route you're driving?
Route A

The driver pressed the yes key and the MDT went back to the main menu.

The driver then began to drive. The MDT did not do anything depending on the speed of the bus. Although the MDT did go into a low power mode.

After about 25 seconds of inactivity the MDT screen dimmed. One minute after the screen dimmed the MDT screen turned off.

VALIDATION RESULTS
Was the MDT automatically powered up with bus power up? YES ☐ NO ☑ N/A ☐ Explain: The MDT required the driver to press a button to power up.
Was the login screen available within less than two (2) minutes after MDT power up? YES ☑ NO ☐ N/A ☐ Explain: The login screen was available in less than 1 minute after power up.
Was the driver able to login by selecting his employee name? YES ☐ NO ☑ N/A ☐ Explain: The MDT required the driver to enter his personal ID number in order to login to the MDT, it then asked him to confirm his name.
Did the MDT automatically retrieve the driver's employee ID from locally stored information? YES ☐ NO ☑ N/A ☐ Explain: The MDT did the opposite of this. It automatically retrieved the driver's name from locally stored information.
Was the driver prompted to input odometer reading? YES ☐ NO ☑ N/A ☐ Explain: There was no prompt for an odometer reading during the login process.
Did the MDT provide a fully functional GPS-synchronized internal clock? YES ☐ NO ☐ N/A ☑ Explain: There could be an internal clock, but the MDT never displayed a time.
Was the driver able to select a route from a list of possible routes? YES ☐ NO ☑ N/A ☐

Explain: The driver had to enter his predetermined route. The driver simply had to enter the letter A into the MDT.

Was the first stop displayed when the driver began his route?

YES ☐ NO ☑ N/A ☐

Explain: The MDT did not display the first stop.

Was the MDT display changed to show only the time-of-day when the vehicle speed was over 5 MPH?

YES ☐ NO ☑ N/A ☐

Explain: The MDT did not act differently as the speed of the bus increased. However, it did go into a low power mode after about 25 seconds.

Did the countdown-to-departure feature of the MDT work when the driver arrived at stops?

YES ☐ NO ☑ N/A ☐

Explain: The MDT did not have a countdown-to-departure feature.

Was the operational scenario (3.2.1 CAL POLY OR LAIDLAW DRIVER STARTING DAY'S WORK) executed successfully?

YES ☐ NO ☑ N/A ☐

Explain: Although the driver was able to login to the MDT and start his day's work, too many of the MDT features were not available. The MDT did not power up when the bus started, there was no odometer reading prompt, no display of the first stop, the MDT display did not change to show only the time-of-day when the vehicle speed was over 5 MPH nor did it have a countdown-to-departure feature.

What worked?

The driver was able to login to the MDT to start his day's work.

What didn't work?

The MDT required the driver to press a button to power up the MDT.
The MDT asked for an ID number instead of a name.
The MDT never prompted the driver to enter an odometer reading.
The MDT required the driver to enter a route instead of simply choosing one.
The MDT never displayed the time.

The MDT did not display the beginning stop nor did it give a departure time for each stop.

3.2.2 CAL POLY OR LAIDLAW DRIVER'S CHANGING SHIFT

DATE: 1-22-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S): Parking and Transportation Services

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.2):

A Laidlaw driver arrives at work and is transported to Cal Poly Pomona to relieve the driver currently servicing Route C. She meets the bus at a predefined location coordinated with the driver ahead of time.

The driver being relieved selects the "Driver Shift Change" function on his MDT. The MDT prompts for the vehicle's odometer reading, and completes the logout process once this is entered. The MDT then displays a shift login screen.

The relief driver then selects her name from the list of possible drivers, confirms her personal ID number, confirms the vehicle's odometer reading, and confirms "Route C" as the route she will be driving.

The MDT then provides her with the next stop location where she should begin her route at and once she reaches it, the MDT indicates minutes to departure.

The MDT automatically collects all pertinent data regarding this shift change (including date, time, odometer, route, location, and drivers involved), and writes it to permanent storage and transmits it to the central site. This information will be available for driver shift report generation later on.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. Relieved driver can signoff MDT using the "Driver Shift Change" function.
2. MDT confirms odometer reading at beginning and end of service (work).
3. MDT displays a shift login screen after relieved driver logs out.
4. Relief driver can sign-on by selecting employee name and confirming personal ID number.
5. Relief driver can confirm route that she will be driving.

6. The MDT displays the first stop when the driver begins his route. (Previously validated, see Section 3.2.1)

7. The MDT displays automatic countdown until departure once a driver reaches a stop. (Previously validated, see Section 3.2.1)

8. Information relating to the shift change transaction is collected, stored and transmitted to the central site.

VALIDATION PLAN

1. Monitor the driver's procedures of using MDT to change shift.

2. Create a data collection sheet (or map) that chronicles and details the relieved driver signoff process and the relief driver sign-on process.

3. Record observations about other factors and impressions. Required observations are:

    - Was the relieved driver able to use the "Driver Shift Change" function to logout?
    - Was the relieved driver prompted to input odometer reading?
    - Did the MDT display a shift login screen after relieved driver logged off?
    - Was the relief driver able to select employee name to login?
    - Was the relief driver prompted to confirm his or her personal ID number?
    - Was the relief driver prompted to confirm odometer reading?
    - Was the relief driver able to confirm route?
    - Was the information relating to the shift change transaction is collected, stored and transmitted to the central site?

NOTES

There is not a "Driver Shift Change" function available on the MDT. The way the drivers do a shift change is by simply using the login and logout function that is available on the MDT.

The driver being relieved pressed the logout button on the MDT. The MDT prompted the driver to enter the vehicle's fuel percentage level which the driver entered. This completed the logout process for the relieved driver.

The MDT went to the main menu after the relieved driver logged out. The relief driver then pressed the login button, which then asked him to enter his personal ID number. After entering

his ID number the MDT prompted the relief driver to confirm his name. The MDT then asked the driver to enter the route. After entering the route the MDT prompted the relief driver to confirm his route. After confirming his route the relief driver was ready to start his shift.

VALIDATION RESULTS
Was the relieved driver able to use the “Driver Shift Change” function to logout? YES ☐ NO ☑ N/A ☐ Explain: The “Driver Shift Change” function was not available. The driver was able to logout by using the logout feature provided by the MDT. This then enabled the relief driver to login.
Was the relieved driver prompted to input odometer reading? YES ☐ NO ☑ N/A ☐ Explain: The MDT did not prompt the relieved driver to input an odometer reading, but it did prompt him to enter a fuel percentage. This feature could be used to generate useful reports just like the odometer reading feature.
Did the MDT display a shift login screen after relieved driver logged off? YES ☑ NO ☐ N/A ☐ Explain: After the relieved driver logged off the MDT went to a main menu which has a login button.
Was the relief driver able to select employee name to login? YES ☐ NO ☑ N/A ☐ Explain: The relief driver was able to enter his ID number to login instead of selected his name.
Was the relief driver prompted to confirm his or her personal ID number? YES ☐ NO ☑ N/A ☐ Explain: The relief driver was prompted to confirm his name after entering his personal ID number which is an equivalent confirmation feature.
Was the relief driver prompted to confirm odometer reading? YES ☐ NO ☑ N/A ☐ Explain: The relief driver was never prompted for an odometer reading.
Was the relief driver able to confirm route?

YES ☑ NO ☐ N/A ☐

Explain: After entering the route the driver was prompted to confirm it.

Was the information relating to the shift change transaction is collected, stored and transmitted to the central site?

YES ☐ NO ☑ N/A ☐

Explain: The information relating to the shift change transaction may be collected, stored and transmitted but management is not able to access it.

Was the operational scenario (3.2.2 CAL POLY OR LAIDLAW DRIVER'S CHANGING SHIFT) executed successfully?

YES ☑ NO ☐ N/A ☐

Explain: Although some of the MDT features were not available the MDT had another feature that was equivalent. Drivers were still able to login to the MDT but instead selecting their names they entered their ID numbers. Drivers were not prompted to enter an odometer reading but when logging out the drivers are asked for a fuel percentage reading. The information relating to the shift change transaction is probably stored but is not yet available. I believe that the information could be available upon request.

What worked?

The relieved driver was able to logout and the relief driver was able to login by using their ID numbers.

What didn't work?

Drivers were not prompted to give an odometer reading.
Driver shift change information cannot be used to generate reports.

3.2.3 CAL POLY OR LAIDLAW DRIVER LOGOUT

DATE: 1-22-09 **TESTER(S):** Ryan Beasley

FACILITATOR(S): Parking and Transportation Services

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.3):

A driver is the last person driving Route C for the day and her shift corresponds to the end of service for this route. The MDT indicates that service for Route C for the day is complete and that she should proceed to the yard after discharging any remaining passengers on-board. The MDT automatically determines that she is at the end of her day using its standard clock and location positioning equipment (GPS), and records the deadhead miles.

Upon arrival at the yard, the driver parks her bus and selects the "End Shift" function on the MDT. The MDT requests the vehicle's odometer reading, and after the driver inputs it, completes the logout process.

The MDT then writes information regarding the driver logout to its permanent storage and transmits it to the central site for later report generation.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. MDT indicates end of day service using its standard clock and GPS.
2. MDT records deadhead miles and transmits to the central site.
3. Driver can logout by using the MDT "End Shift" function.
4. MDT prompts driver for odometer reading at end of service (work).
5. Information relating to the logout transaction is collected, stored and transmitted to the central site.

VALIDATION PLAN

1. Monitor the driver's procedures of using the MDT to end shift.
2. Create a data collection sheet (or map) that chronicles and details the driver's ending shift process.
3. Record observations about other factors and impressions. Required observations are:

- Did the MDT prompt driver at the end of the service day?
- Did the MDT record the deadhead miles at the end of the service day?
- Was the driver able to logout using the “End Shift” function?
- Was the driver prompted to input odometer reading?
- Was the information relating to the logout transaction collected, stored and transmitted to the central site?

NOTES

The MDT did not automatically determine that the driver was at the end of his shift nor did it record deadhead miles. The drivers are set to a specific schedule and know when their shift ends.

At the end of the drivers shift he pressed the logout button on the MDT. The driver was prompted to input the fuel percentage level and after he input it the logout process was complete.

VALIDATION RESULTS
Did the MDT automatically determine that the driver was at the end of her day using its standard clock and GPS? YES ☐ NO ☑ N/A ☐ Explain: The MDT does have a GPS but did not automatically determine that the driver was at the end of his day.
Did the MDT prompt driver at the end of the service day? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not have this feature.
Did the MDT record the deadhead miles at the end of the service day? YES ☐ NO ☑ N/A ☐ Explain: The MDT did not record deadhead miles.
Was the driver able to logout using the “End Shift” function? YES ☑ NO ☐ N/A ☐ Explain: The driver was able to logout by pressing the logout button on the MDT.
Was the driver prompted to input odometer reading? YES ☐ NO ☑ N/A ☐ Explain: The driver was not prompted to input an odometer reading but was prompted to input a fuel percentage reading.
Was the information relating to the logout transaction collected, stored and transmitted to the central site? YES ☐ NO ☑ N/A ☐ Explain: The information relating to the shift change transaction may be collected, stored and transmitted but it is not accessible.
Was the operational scenario (3.2.3 CAL POLY OR LAIDLAW DRIVER LOGOUT) executed

successfully? YES ☐ NO ☑ N/A ☐ Explain: The driver was able to logout and end her shift but due to the many unavailable MDT features this scenario was not successful.
What worked? The driver was able to logout using the MDT.
What didn't work? The MDT did not automatically determine that the driver was at the end of his shift using its standard clock and GPS. The odometer readings and deadhead miles were not recorded. The information relating to the shift change transaction was not available for later reports.

3.2.4 CAL POLY OR LAIDLAW DRIVER ON ROUTE AND PICKING UP PASSENGERS

DATE: 1-27-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S): Parking and Transportation Services

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.4):

A driver on Route C, arrives at the Library on the Cal Poly campus as part of his route. The MDT display indicates that he has arrived at the Library, what the current time is, and how many minutes remain until he should depart the stop.

The driver presses a "CPP Rider" button on the MDT each time a passenger boards. He is pleased to be doing this, as he recalls how he used to have to record this information manually using a pencil and paper. He now no longer has to complete any paperwork regarding passenger boarding.

The last passenger waiting at the stop boards the bus. The driver checks his MDT and it indicates that he should depart in 1 minute. He waits one minute, closes the door and departs. The driver also enjoys having the MDT coordinate his departure time, as he no longer has to worry about manually maintaining proper spacing with the other bus on Route C. Once the bus is in motion, the MDT blanks its display and shows only the current time in easy to read digits that are about ¾ inch tall.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The MDT display indicates when a driver has arrived at a stop. (Previously validated, see Section 3.2.1)
2. The MDT display indicates what the current time is after arriving at a stop.
3. The MDT display indicates how many minutes remain until departure. (Previously validated, see Section 3.2.1)
4. MDT provides CPP Rider button for manual passenger count.
5. The MDT shows the time-of-day in ¾ inch tall digits once the bus is in motion.

VALIDATION PLAN

1. Monitor and create a data collection sheet (or map) that chronicles and details the driver's procedures of using MDT to count passengers manually.

2. Record observations about other factors and impressions. Required observations are:
    - Did the MDT display indicate what the current time was after arriving at a stop?
    - Was the "CPP Rider" button available?
    - Did the MDT show the time-of-day in ¾ inch tall digits once the bus was in motion?

NOTES

When starting this scenario the driver was already logged into the MDT. We started at the University Village shuttle stop.

The driver had to touch one of the buttons to get the MDT out of its power-saver mode. After the MDT was out of that mode it displayed the main screen. This main screen had the following buttons: emergency button, login menu, messages menu, settings menu, and admin menu.

There was no way to determine that the bus was at the University Village shuttle stop. The MDT did not show a current time nor did it give the driver a countdown-to-departure. When students boarded the bus the driver manually counted them. There was no button on the MDT that the driver could have pressed to count the passengers.

The automatic passenger counters are installed on the buses but the transportation services still have the drivers counting the passengers as the board the bus because the system is still new to them. Once they utilize the installed APCs the drivers will not have to do manually counting anymore.

VALIDATION RESULTS
Did the MDT display indicate what the current time was after arriving at a stop? YES ☐ NO ☑ N/A ☐ Explain: The MDT did not do anything differently as it arrived at stops, nor did it ever display the current time.
Was the "CPP Rider" button available? YES ☐ NO ☑ N/A ☐ Explain: The MDT did not provide CPP Rider button.
Did the MDT show the time-of-day in ¾ inch tall digits once the bus was in motion? YES ☐ NO ☑ N/A ☐ Explain: The MDT simply did not show the time-of-day once the bus was in motion.
Was the operational scenario (3.2.4 CAL POLY OR LAIDLAW DRIVER ON ROUTE AND PICKING UP PASSENGERS) executed successfully? YES ☐ NO ☑ N/A ☐ Explain: None of the features of the MDT in this scenario were available.
What worked? N/A
What didn't work? The MDT did not provide CPP Rider button. The MDT never showed the current time-of-day. The MDT did not provide a countdown-to-departure nor did it nor did it indicate when the driver arrived at a stop.

3.2.5	CAL POLY OR LAIDLAW DRIVER ON ROUTE AND PICKING UP RIDERS WITH AUTOMATIC PASSENGER COUNTER (POSSIBLE FUTURE FEATURE)
DATE: 1-27-09	**TESTER(S):** Ryan Beasley
FACILITATOR(S):	

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.5):

A driver is driving one of the buses with an automatic passenger counter (APC) installed. When she opens either or both doors at stops, she sees that the "Riders On Board" counter display automatically increases when riders board her bus. She also sees that the counter decreases when riders get off the bus.

The driver feels very happy because she does not need to count passengers manually at each stop and report the counts back to the dispatch offices. She understands that the APC is doing all of her counting work behind the scenes.

The driver also feels that the APC reduces her workload and stress significantly, allows her to pay more attention to passenger needs, and increases safety.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. APC shall be provided for each door.
2. MDT displays passenger counts (increases or decreases) while APC detects boarding and alighting.
3. APC shall reduce driver's workload and stress.

VALIDATION PLAN

1. Monitor the procedures of using MDT to record and display APC passenger counts
2. Create a data collection sheet (or map) that chronicles and details the APC passenger counting process
3. Record observations about other factors and impressions. Required observations are:
    - Was the APC provided for each door?
    - Did the MDT display APC passenger counts?

- Did the “Riders On Board” counter display automatically increase when riders boarded the bus and decrease when riders got off the bus?
- Did the APC reduce the driver’s workload and stress?

NOTES

We started at the Building 94 Shuttle Stop. Once again the driver had to press a button on the MDT to get it out of its power safe mode.

When the passengers boarded the bus there was no indication of the action on the MDT. The driver was not able to tell if the APC was counting the passengers boarding or getting off the bus.

The driver continued to record the number of passengers that boarded the bus. The drivers are still required to this because the APC and MDT systems are still new.

The driver agreed that the APC would reduce his workload and stress significantly, allow him to pay more attention to passenger needs, and increase safety.

In generated reports it was shown that the APC did count the passengers boarding and leaving the bus. The number of passengers leaving the bus was off by 3 people out of the 10 that boarded. The number of passengers that boarded the bus was completely accurate.

VALIDATION RESULTS
Was the APC provided for each door? YES ☑ NO ☐ N/A ☐ Explain: Both doors on the buses were equipped with an APC.
Did the MDT display APC passenger counts? YES ☐ NO ☑ N/A ☐ Explain: The MDT did not display any passenger information.
Did the “Riders On Board” counter display increase when riders boarded the bus? YES ☐ NO ☑ N/A ☐ Explain: The MDT did not provide a “Riders On Board” counter display.
Did the “Riders On Board” counter display decrease when riders got off the bus? YES ☐ NO ☑ N/A ☐ Explain: The MDT did not provide a “Riders On Board” counter display.
Did the APC reduce the driver’s workload and stress? YES ☐ NO ☐ N/A ☑ Explain: The driver said that the APC would reduce the driver’s workload and stress, but as of right now he still has to manually count passengers that board the bus.
Was the operational scenario (3.2.5 CAL POLY OR LAIDLAW DRIVER ON ROUTE and PICKING UP RIDERS WITH AUTOMATIC PASSENGER COUNTER [POSSIBLE FUTURE FEATURE]) executed successfully? YES ☐ NO ☑ N/A ☐ Explain: The APC did count passenger boarding and alighting, but the information was not displayed on the MDT.
What worked?

The APC detected the boarding and alighting of passengers.
What didn't work? Passenger boarding and alighting were not displayed on the MDT.

3.2.6 DANGEROUS SITUATION ON BUS

DATE: 2-5-09 **TESTER(S):** Ryan Beasley, Neil Hockaday, Patrick Halcrow

FACILITATOR(S): Parking and Transportation Services

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.6):

A driver is driving Route A and determines that a dangerous person is on the bus. The person is harassing other passengers, threatening the driver, and making obscene remarks. The driver does not know exactly how dangerous the person is, but is hesitant to call for help on the radio for fear of being assaulted.

The driver waits until the dangerous person is yelling at the rear of the bus and presses the Driver's Emergency Button that is installed below her left thigh on the bus. The driver holds the button down for the required one and a half seconds and a silent emergency signal is sent from the MDT to the dispatch center via the communications link.

Dispatchers at both centers are alerted to the emergency condition via audible and visual alarms on their EDAPTS consoles. On both consoles the emergency alert is given a priority, locking out all normal functions. In addition, the bus having the emergency is automatically put into a "Tracking Mode". In this mode the bus location is transmitted to the dispatch center every 15 seconds until an authorized individual clears the alarm.

The Laidlaw dispatcher, who first sees the problem, begins handling the alarm; taking responsibility for the situation and unlocking the remaining dispatch console at Cal Poly Pomona.

The Laidlaw dispatcher clicks on a GUI button that is presented and then begins a preprogrammed emergency mode dialog with the driver on the bus involved. This includes asking a coded question about the bus operational status. Based on the driver's correct response to the question, the dispatcher determines that the alert is a real situation and promptly dispatches the emergency responders to the bus location as displayed on his console screen.

By watching the GPS location data from the bus, the dispatcher keeps the emergency responders up to date on the bus current location to make sure no time is wasted in trying to find it.

Once the situation is over, the driver and the dispatcher talk about what happened and feel confident that the new emergency system helped prevent a potentially dangerous situation

from getting out of hand. The new procedure, with its coded message protocol for false alarms, prevents unnecessary dispatch of emergency personnel and assures prompt response in an emergency.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. An emergency button shall be installed below the driver's left thigh.
2. The emergency button shall activate the emergency notification procedure when a driver presses the button for more than 1.5 seconds.
3. The MDT transmits the emergency notification to the central site, which then alerts all dispatcher consoles - both visually and audibly.
4. In an emergency, the bus is put in a GPS "Tracking Mode" where the bus location is transmitted to the dispatch center every 15 seconds.
5. The emergency alert is given priority, locking out all normal functions on the dispatcher consoles until a dispatcher takes responsibility for the emergency by clicking on a GUI button.
6. The system prompts the dispatcher to ask coded questions to the driver.

VALIDATION PLAN

1. Monitor a simulated dangerous situation and its response on bus.
2. Simultaneously observe driver and dispatcher emergency activation and response procedures.
3. Create a data collection sheet (or map) that chronicles and details the emergency activation and response as well as false alarm handling process.
4. Record observations about other factors and impressions. Required observations are:
    - Was an emergency button installed below the driver's left thigh?
    - Was an emergency signal sent to dispatcher after driver pressed the button over 1.5 seconds?
    - Were all dispatchers alerted to the emergency visually and audibly?
    - In the case of an emergency, was the bus put in a GPS "Tracking Mode" where the bus location was transmitted to the dispatch center every 15 seconds?
    - Did the system lock out all normal functions on the dispatcher consoles until a dispatcher took responsibility for the emergency?

- Did the system prompt the dispatcher to ask coded questions to the driver?

NOTES

The emergency button is located on the MDT. The button does not need to be held down for any amount of time. The alarm is sent just as long as you press the button.

When the emergency button was pressed the following message was sent to the dispatch console:

dir	vehicle	message	time
[in]	(198) Don Marrolli	EMERGENCY! EMG BUTTON PRESSED	12:06P, Wed 2/4
[in]	(071) [none]	EMERGENCY! EMG BUTTON PRESSED	02:27P, Tue 2/3

The window did not flash nor did it make a sound when the emergency message was sent. The console was not locked down nor did it automatically track the vehicle that pressed the emergency button.

Although the bus was not automatically put in a tracking mode, the dispatcher can put a bus in a tracking mode. The dispatcher simply has to select the bus he or she wants to track and it will zoom in and follow the movement of the bus. On this map the position of the bus is updated approximately every 7 seconds. This updating time is the same no matter if the dispatcher is tracking one bus or all of the buses.

The dispatch console is never locked throughout the whole process and the dispatch console does not provide any coded questions. The dispatchers do have their own way of detecting whether it is a false alarm or not.

VALIDATION RESULTS

Was an emergency button installed below the driver's left thigh?

YES ☐ NO ☑ N/A ☐

Explain: The button is installed on the MDT and can be easily seen by other passengers.

Was an emergency signal sent to dispatcher after driver pressed the button over 1.5 seconds?

YES ☐ NO ☑ N/A ☐

Explain: The emergency signal is sent to the dispatcher immediately after the driver presses the button. The driver does not need to hold the button for 1.5 seconds. Also, if the device is in the power-saver mode and the emergency button is pressed the emergency signal is sent to dispatch.

Were all dispatchers alerted to the emergency visually and audibly?

YES ☐ NO ☑ N/A ☐

Explain: The dispatchers were only alerted visually. There were no sounds on the dispatch console. The emergency message behaves the same as the 10-4 message or any other message sent from a bus via the MDT.

In the case of an emergency, was the bus put in a GPS "Tracking Mode" where the bus location was transmitted to the dispatch center every 15 seconds?

YES ☐ NO ☑ N/A ☐

Explain: The bus was not automatically put into a tracking mode, but the dispatcher could put a bus in a tracking mode where the bus location would be updated every 7 seconds.

Did the system lock out all normal functions on the dispatcher consoles until a dispatcher took responsibility for the emergency?

YES ☐ NO ☑ N/A ☐

Explain: Every feature was still available after the driver sent the emergency message.

Did the system prompt the dispatcher to ask coded questions to the driver?

YES ☐ NO ☑ N/A ☐

Explain: The system never prompted the dispatcher to do anything about the emergency; it simply showed that the emergency button was pressed.

Was the operational scenario (3.2.6 DANGEROUS SITUATION ON BUS) executed successfully?

YES ☐ NO ☑ N/A ☐

Explain: The "Tracking Mode" did not automatically engage in the case of an emergency. The emergency signal acted the same as a normal message. There was no flashing or sounds to alert the dispatcher that an emergency was occurring. Also, a false alarm can easily occur since the button does not need to be pressed down for a specific amount of time. The button was not hidden from passengers, which would make it very hard to press in the case of an emergency without passengers noticing the action.

What worked?

The bus could be put into a "Tracking Mode" where the bus location was updated every 7 seconds.

What didn't work?

The emergency button was not installed in a well-hidden area.
The emergency button did not need to be held down for over 1.5 seconds to send an alarm.
Dispatchers were not alerted audibly and were poorly alerted visually.
The system did not lock out all normal functions when an emergency occurred.
The system did not prompt the dispatcher to ask coded questions.

3.2.7 GOING ON BREAK

DATE: 1-27-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S): Parking and Transportation Services

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.7):

A Laidlaw driver is driving on Route C. The MDT indicates his scheduled arrival time at each stop as he arrives at it.

Upon arriving at the location for the driver's scheduled break, the MDT indicates "Driver Rest Stop" and then begins counting down the minutes until he is to depart and begin driving his route. He changes the vehicles electronic route sign to say "Not In Service".

Upon seeing the MDT count down to zero, the driver changes the vehicle's electronic route sign to say "Route C" and begins driving the route. The MDT begins reporting arrivals at stops as he progresses along his route.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The MDT indicates his scheduled arrival time at each stop as he arrives at it.
2. The MDT indicates "Driver Rest Stop" when the driver's scheduled break occurs.
3. The MDT displays break time countdown.
4. The vehicle sign displays "Not In Service" when the driver is on break and displays route number while in motion.
5. The MDT reports arrivals at stops.

VALIDATION PLAN

1. Monitor the driver's break time procedures
2. Create a data collection sheet (or map) that chronicles and details the display of scheduled arrival time at bus stop, countdown, and vehicle signs
3. Record observations about other factors and impressions. Required observations are:
    - Was the scheduled arrival time displayed on MDT when the bus arrived at each stop?

- Did MDT indicate the “Driver Rest Stop” when the scheduled break occurred?
- Did the MDT countdown the driver’s break time?
- Was the driver able to change the vehicle sign display to “Not In Service” when the driver was on break?
- Was the driver able to change the vehicle sign display to the route number when the driver started driving the route?
- Did the MDT report arrivals at stops?

NOTES

In this scenario the driver’s scheduled 15 minute break is to start at 2:00PM. I was picked up at the Building 94 Shuttle Stop. The driver’s scheduled stop always begins after dropping off all the passengers off at the University Village. For the next few stops the MDT did not indicate his scheduled arrival time at each stop as he arrived at it.

The driver arrived at the University Village at 2:05PM, dropped off all the remaining passengers and began his break. The MDT never indicated that the driver’s schedule break occurred.

When the driver began his break the MDT did not countdown the driver’s break time.

The driver was also not able to change the vehicle sign display because the vehicle was not equipped with a sign.

When the driver came back from his break the MDT did not report arrivals at stops.

VALIDATION RESULTS
Was the scheduled arrival time displayed when the bus was stopped? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not have this feature.
Did MDT indicate the driver's rest stop when the scheduled break occurred? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not have this feature.
Did the MDT countdown the driver's break time? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not have this feature.
Was the driver able to change the vehicle sign display to "Not In Service" when the driver was on break? YES ☐ NO ☑ N/A ☐ Explain: The bus was not equipped with a vehicle sign display.
Was the driver able to change the vehicle sign display to the route number when the driver started driving the route? YES ☐ NO ☑ N/A ☐ Explain: The bus was not equipped with a vehicle sign display.
Did the MDT report arrivals at stops? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not have this feature.
Was the operational scenario (3.2.7 GOING ON BREAK) executed successfully? YES ☐ NO ☑ N/A ☐

Explain: All of the MDT features in this scenario were not available for the driver. Although the driver was able to take his break the MDT was not able to assist the driver.
What worked? N/A
What didn't work? The driver was not able to change the vehicle sign display as he took and came back from his break. The scheduled arrival time was not displayed at any of the stops. The MDT did not indicate the driver's rest stop when the scheduled break occurred. The MDT did not countdown the driver's break time. The MDT did not report arrivals at stops.

3.2.8 FUELING

DATE: 1-29-09 | **TESTER(S):** Ryan Beasley

FACILITATOR(S): Parking and Transportation Services

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.2.8):

A driver is assigned to drive Route B. After he finishes his eight-hour service, he drives his Laidlaw bus to the University's fuel station and begins refueling the vehicle.

Once fueling is complete, the driver selects the "Fueling" function on the MDT menu list. The MDT display shows a dialog on which he enters the number of gallons filled and the odometer reading of the bus. The new system does not require any paper-based record keeping, but rather logs all information automatically and transmits it to the central site so that it can be incorporated into monthly reports.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The MDT provides a "Fueling" function
2. Driver is prompted for and enters number of gallons filled and odometer reading after selecting the "Fueling" function.
3. Fueling information is stored and presented in monthly reports.

VALIDATION PLAN

1. Monitor the driver's fueling procedures
2. Create a data collection sheet (or map) that chronicles and details the fueling procedure.
3. Record observations about other factors and impressions. Required observations are:
    - Was the "Fueling" function provided by the MDT?
    - Was the driver prompted to enter gallon amount?
    - Was the driver prompted to enter odometer reading?
    - Was the information (number of gallons and odometer reading) provided in monthly report?

NOTES

The MDT does not provide a “Fueling” function so this scenario could not be tested. When fueling the buses the drivers do not use the MDT during any part of the process.

All of the First Transit (Laidlaw) buses are required to fuel their buses at the beginning of their shifts.

The Cal Poly Pomona driver fuels his bus during one of his breaks when he knows that his fuel is too low. To fuel his bus he goes to the auto shop. He simply goes to the gas station, puts gas in his bus and then goes back to his normal duties.

VALIDATION RESULTS
Was the “Fueling” function provided by the MDT? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not provide a “Fueling” function.
Was the driver prompted to enter gallon amount? YES ☐ NO ☑ N/A ☐ Explain: The driver was never prompted by the MDT to enter the gallon amount during the fueling process.
Was the driver prompted to enter odometer reading? YES ☐ NO ☑ N/A ☐ Explain: The driver was never prompted by the MDT to enter a odometer reading during the fueling process.
Was the information (number of gallons and odometer reading) available in monthly report? YES ☐ NO ☑ N/A ☐ Explain: There is no report available that provides fueling information.
Was the operational scenario (3.2.8 FUELING) executed successfully? YES ☐ NO ☑ N/A ☐ Explain: The driver was not able to use a “Fueling” function on the MDT because it was not provided.
What worked? N/A
What didn’t work? The MDT did not provide a “Fueling” function.

3.3 Dispatchers Drivers and Vehicles

3.3.1 DISPATCHERS AT WORK

DATE: 1-29-09 | **TESTER(S):** Ryan Beasley

FACILITATOR(S): Parking and Transportation Services, First Transit

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.3.1):

Upon arriving at work, a Laidlaw dispatcher powers up his EDAPTS dispatch console. He selects the Fleet Status section on his console as he does everyday, and makes both a Bronco Express System map and a Fleet Status table available for his dispatching activities. The Fleet Status table looks like the one below:

ROUTE	OPERATOR	STATUS	LAST STOP	NEXT STOP	LOADING
A-1	State Driver's Name	on route	Rose Garden	Building 1	15/24
A-2	Laidlaw Driver's Name	on route	Building 1	Rose Garden	10/24
B-1	Laidlaw Driver's Name	on break	Kellogg West	Collins School	0/24
B-2	Laidlaw Driver's Name	on route	Building 1	Rose Garden	5/16
C-1	Laidlaw Driver's Name	on break	Market Place	Environmental Design	0/24
C-2	Laidlaw Driver's Name	on route	Campus Center	Building 77	1/16

The dispatcher knows that the system map will update its bus location status every minute. The Fleet Status table will update its information whenever a bus arrives or departs a stop or a driver break location.

The dispatcher also knows that the State dispatcher has the same information available to them. This helps them communicate over the telephone more effectively regarding vehicle operations.

Around 12:15 PM, the Laidlaw dispatcher receives a radio message from the driver on Route C. The driver prefers to take a “short” break at the “Building 29” bus stop since he needs to go to a restroom as quickly as possible. The “Building 29” bus stop is not the scheduled bus stop for a break. However it is the bus stop closest to a restroom the driver knows.

The dispatcher accepts his request. He notices that the bus on Route C does not move during the driver’s short break.

Around 12:35 PM, the driver on Route C finishes his break and starts his service. The dispatcher notices that the bus on Route C is moving again on the system map.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide fleet status information in a map and table.
2. The system map updates its bus location status every minute.
3. The Fleet Status table updates the fleet status information whenever a bus arrives or departs a stop or a driver break location.
4. The Laidlaw and State dispatchers can both monitor real-time bus location.

VALIDATION PLAN

1. Observe dispatcher's activities to monitor bus operations using the system maps and tables.
2. Create a data collection sheet (or map) that chronicles and details the dispatcher's procedures of monitoring bus operations.
3. Record observations about other factors and impressions. Required observations are:
    - Was the dispatcher console(s) provided a system map to monitor the real-time bus location?
    - Was the dispatcher console(s) provided a system table to summarize the fleet status (Including: driver name, bus status, last stop, next stop and passenger load)?
    - Did the system map update bus locations every minute?
    - Did the Fleet Status table update the fleet status information whenever a bus arrived or departed a stop or a driver break location?
    - Were the dispatchers able to monitor real-time bus location?

NOTES

As of right now the Cal Poly Pomona dispatcher's console is different than the First Transit (Laidlaw) dispatcher's console. Most of the testing in these scenarios is done from the Cal Poly Pomona dispatcher's console. The First Transit dispatchers may later have the same console, but as of right now they do not have access. They do not have access because in order to give them access to the dispatch console they also are able to edit shuttle stops and other features that Cal Poly Pomona is in charge of.

The Cal Poly Pomona dispatcher has three different features on her dispatch console. One is the vehicle status which looks like the following:

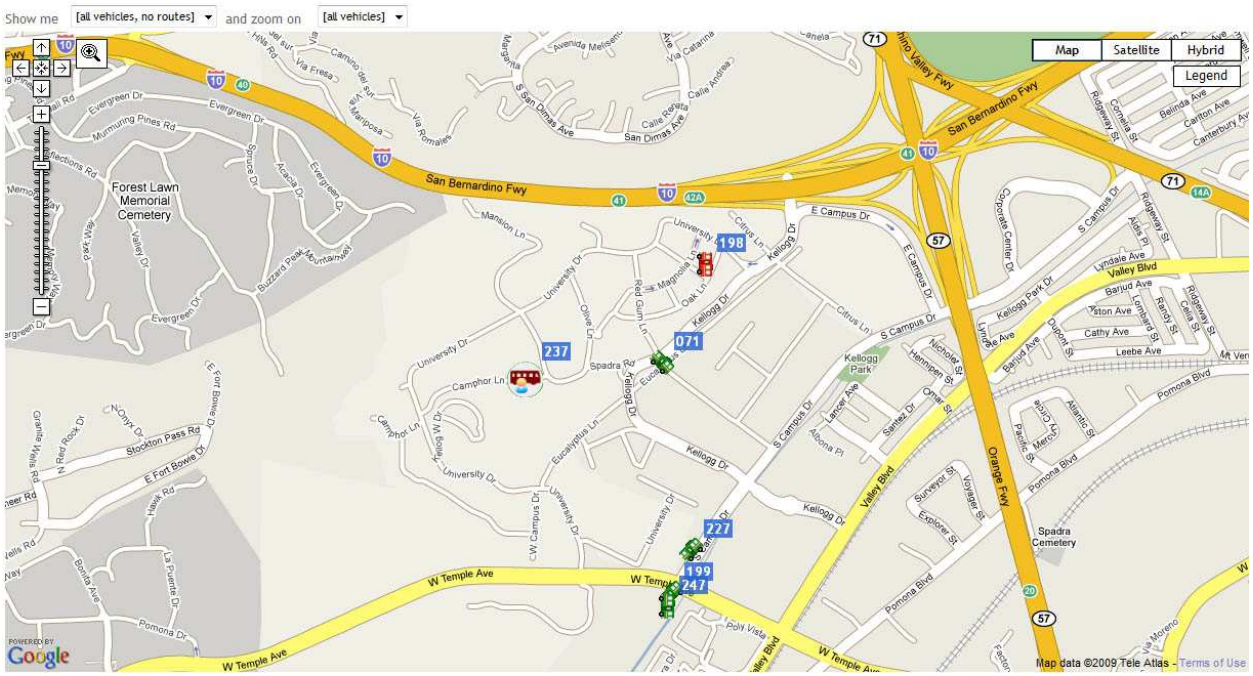
Group: Laidlaw Buses — edit this group | add a group

assign	name	ignition	speed	route	last check in	last position
☑	064		0 MPH	[none]	09:12P, Thu 1/22 = 6d13hr44m ago	08:43P, Thu 1/22 = 6d14hr13m ago
☑	071		8 MPH	Route B-2	10:56A, Thu 1/29 = 0m ago	10:57A, Thu 1/29 = 0m ago
☑	104		0 MPH	[none]	02:39P, Thu 1/22 = 6d20hr17m ago	02:31P, Thu 1/22 = 6d20hr25m ago
☑	227		10 MPH	Route C	10:56A, Thu 1/29 = 0m ago	10:57A, Thu 1/29 = 0m ago
☑	237		0 MPH	Route C	10:56A, Thu 1/29 = 0m ago	10:56A, Thu 1/29 = 0m ago
☑	247		24 MPH	Route A	10:56A, Thu 1/29 = 0m ago	10:57A, Thu 1/29 = 0m ago

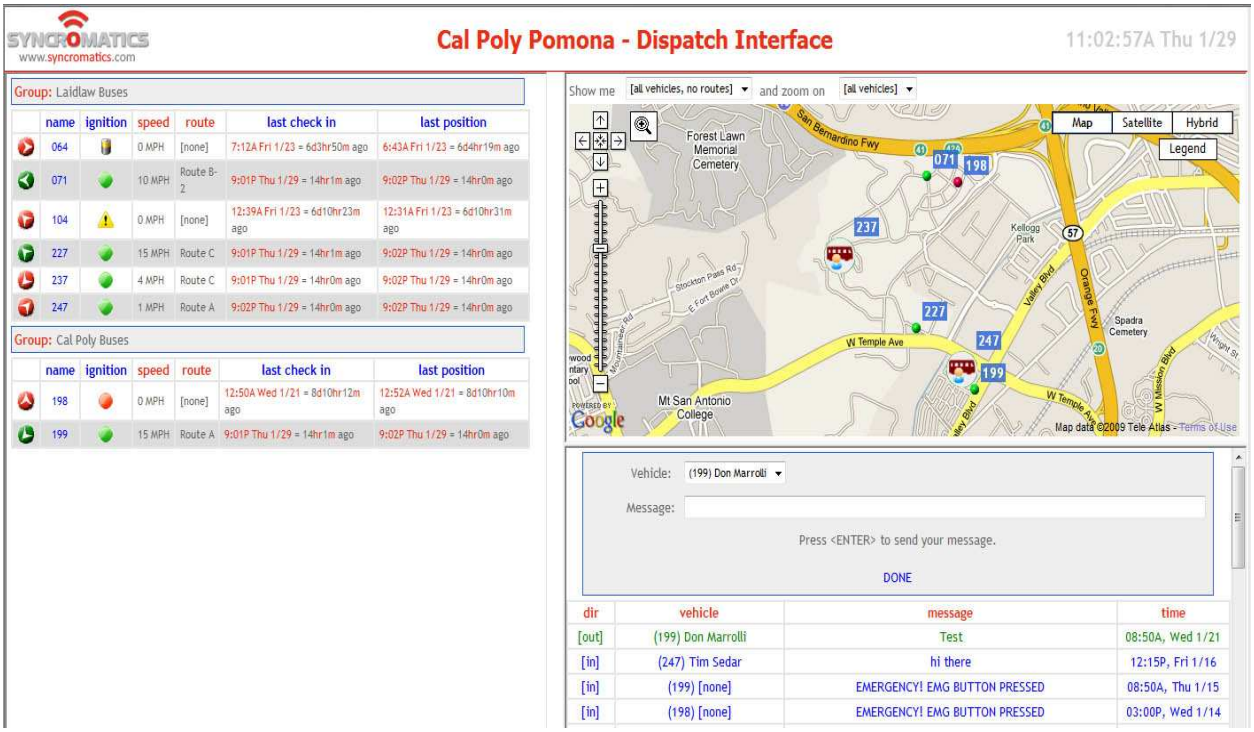
Group: Cal Poly Buses — edit this group | add a group

assign	name	ignition	speed	route	last check in	last position
☑	198		0 MPH	[none]	02:50P, Tue 1/20 = 8d20hr6m ago	02:52P, Tue 1/20 = 8d20hr4m ago
☑	199		9 MPH	Route A	10:56A, Thu 1/29 = 0m ago	10:57A, Thu 1/29 = 0m ago

They also have a live map that looks like the following:



The last feature is a messaging menu on which they can send messages to the drivers logged into the MDT. The drivers can also send messages to the dispatchers via the MDT. All three features put together the dispatch console which looks like the following:

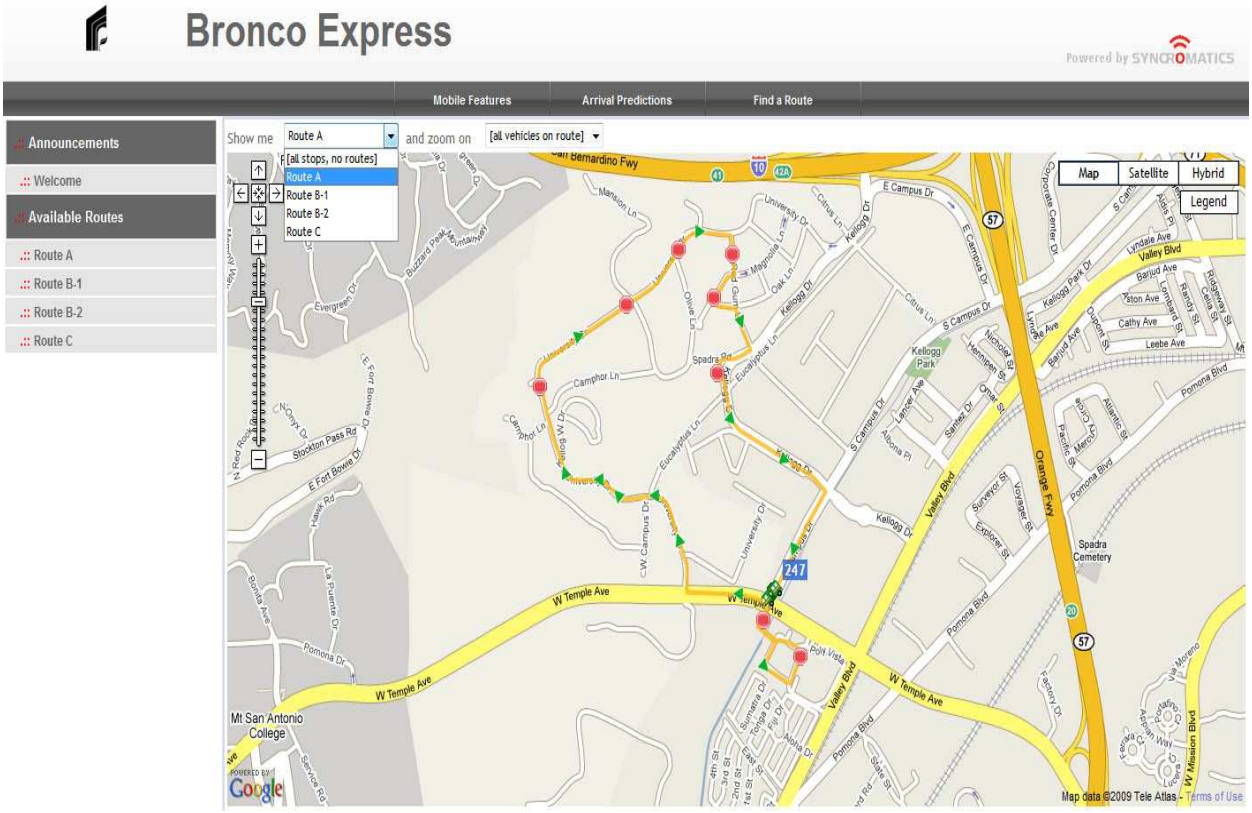

SYNCROMATICS
www.syncromatics.com
Cal Poly Pomona - Dispatch Interface
11:02:57A Thu 1/29
Group: Laidlaw Buses
name ignition speed route last check in last position
064 0 MPH [none] 7:12A Fri 1/23 = 6d3hr50m ago 6:43A Fri 1/23 = 6d4hr19m ago
071 10 MPH Route B-2 9:01P Thu 1/29 = 14hr1m ago 9:02P Thu 1/29 = 14hr0m ago
104 0 MPH [none] 12:39A Fri 1/23 = 6d10hr23m ago 12:31A Fri 1/23 = 6d10hr31m ago
227 15 MPH Route C 9:01P Thu 1/29 = 14hr1m ago 9:02P Thu 1/29 = 14hr0m ago
237 4 MPH Route C 9:01P Thu 1/29 = 14hr0m ago 9:02P Thu 1/29 = 14hr0m ago
247 1 MPH Route A 9:02P Thu 1/29 = 14hr0m ago 9:02P Thu 1/29 = 14hr0m ago
Group: Cal Poly Buses
name ignition speed route last check in last position
198 0 MPH [none] 12:50A Wed 1/21 = 8d10hr12m ago 12:52A Wed 1/21 = 8d10hr10m ago
199 15 MPH Route A 9:01P Thu 1/29 = 14hr1m ago 9:02P Thu 1/29 = 14hr0m ago
Show me [all vehicles, no routes] and zoom on [all vehicles]
Map Satellite Hybrid
Legend
Forest Lawn Memorial Cemetery
San Bernardino Fwy
071
198
237
227
247
199
W Temple Ave
Mt San Antonio College
Kellogg Park
Spadra Cemetery
Valley Blvd
Orange Fwy
W Mission Blvd
Google
Map data ©2009 Tele Atlas - Terms of Use
Vehicle: (199) Don Marrolli
Message:
Press <ENTER> to send your message.
DONE
dir vehicle message time
[out] (199) Don Marrolli Test 08:50A, Wed 1/21
[in] (247) Tim Sedar hi there 12:15P, Fri 1/16
[in] (199) [none] EMERGENCY! EMG BUTTON PRESSED 08:50A, Thu 1/15
[in] (198) [none] EMERGENCY! EMG BUTTON PRESSED 03:00P, Wed 1/14

First Transit dispatchers only has the live map feature. They cannot message the drivers via the MDT nor do they have a status table.

The live map updates every 7 seconds and the status table is updated about every minute.

The Cal Poly Pomona dispatcher has a radio that she can use to contact the Cal Poly Pomona driver. Each First Transit driver has their own personal phone that acts as a radio for which the First Transit dispatcher can reach them.

I was given access to the Cal Poly Pomona Dispatch Console, and the way First Transit monitors the bus is by using the map available at www.broncoshuttle.com that is available to the public. The First Transit dispatch console would look like the following:



Since this scenario involved a First Transit dispatcher, I went to www.broncoshuttle.com to monitor the buses. Since I knew that the communication between the First Transit dispatcher and driver was via a phone I simply monitored a bus go on its break.

It was very easy to see that a bus was not moving during its break.

VALIDATION RESULTS
Were dispatcher console(s) provided a system map to monitor the real-time bus location? YES ☑ NO ☐ N/A ☐ Explain: Both dispatchers are able to view the real-time location of the buses via a system map.
Were dispatcher console(s) provided a system table to summarize the fleet status (Including driver name, bus status, last stop, next stop and passenger load)? YES ☐ NO ☑ N/A ☐ Explain: Only the Cal Poly Pomona dispatcher was provided a system table. The information on the table was a bit different but it was equivalent. It did not simply show the last stop and next stop, but when the position of the bus was updated. It showed the status of the bus and the bus number, but it did not show the driver name. By use of the messaging menu you can relate the driver name with the bus.
Did the system map update bus location every minute? YES ☑ NO ☐ N/A ☐ Explain: The system map updated the bus location every 7 seconds.
Did the Fleet Status table update the fleet status information whenever a bus arrived or departed a stop or a driver break location? YES ☑ NO ☐ N/A ☐ Explain: The fleet status information was updated every minute which is a bit better than at each stop.
Were the dispatchers able to monitor real-time bus location? YES ☑ NO ☐ N/A ☐ Explain: Both dispatchers are given access to a map that shows the real-time bus location.
Was the operational scenario (3.3.1 DISPATCHERS AT WORK) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: Both dispatchers were able to use their consoles to view the driver take his break. They

are also able to see the status of all the other buses.
What worked? Both dispatchers were able to use their dispatch consoles to monitor the location and status of all buses.
What didn't work? The Cal Poly Pomona dispatcher's console was not able to directly see the name of the driver on the bus. The First Transit dispatcher was not able to access a system table.

3.3.2 DISPATCHERS KNOW WHERE VEHICLES ARE

DATE: 1-29-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.3.2):

A dispatcher is on duty, and receives a phone call from the wife of a Route B driver. His wife needs to go to hospital to deliver her first baby. The dispatcher needs notify the driver and to send a substitute to relieve him.

The dispatcher selects the system map and the Fleet Status table on the console to determine the location of the driver she is trying to find.

The dispatcher communicates with the substitute driver and instructs her where and when to intercept the bus so that she can take over the route. She informs the original driver via a dedicated radio channel that his wife is on the way to the hospital and where the substitute driver will relieve him.

When the drivers meet up, the original driver logs off from the MDT and the substitute driver logs into the EDAPTS system. The substitute driver reports to the dispatcher she is logged on and the route is back in service.

The dispatcher selects the Fleet Status function on the EDAPTS console and sees the driver's name has changed on Route B.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide fleet status information in a map and table. (Previously validated, see Section 3.3.1)
2. The dispatcher is able to communicate with drivers via a dedicated radio channel.
3. The system shall allow an original driver to log off from the MDT and allow a substitute driver to log into the EDAPTS system. (Previously validated, see Section 3.2.2)
4. The dispatcher is able to see driver's name change on the fleet status table.

VALIDATION PLAN

1. Observe dispatcher's activities to substitute a driver.

2. Create a data collection sheet (or map) that chronicles and details the dispatcher's procedures of substituting a driver.

3. Record observations about other factors and impressions. Required observations are:

    - Was the dispatcher able to communicate with the drivers via a dedicated radio channel?

    - Was the dispatcher able to see driver's name change on the fleet status table?

NOTES

Because Cal Poly Pomona only has one driver, if any driver needed to be replaced he or she would need to be replaced by a First Transit (Laidlaw) driver.

From section 3.3.1: First Transit dispatchers and drivers communicate via a phone. A First Transit dispatcher would get another driver to replace the driver that had an emergency.

It would be very disruptive for the First Transit services to send a replacement bus driver to Cal Poly Pomona just for testing purposes. Because the replacement is just like a normal shift change I used the website that First Transit uses to monitor the shift change. This website does not show you the names of the buses nor would it show a driver logging in and out of a MDT.

If a Cal Poly Pomona dispatcher were to monitor the shift change he or she would also not be able to directly see the shift change. The only way to detect that a driver had logged out of the MDT and another driver had logged into the MDT is to notice the change in the message menu. The dispatcher would notice that the replaced driver would no longer be on the list of drivers to message but the replacement driver would be.

As I watched a shift replacement on www.broncoshuttle.com I was not able to determine when the replaced driver logged off the MDT nor was I able to determine when the replacement driver logged in.

VALIDATION RESULTS

Was the dispatcher able to communicate with the drivers via a dedicated radio channel?

YES ☑ NO ☐ N/A ☐

Explain: Dispatchers are able to communicate to their drivers via a phone.

Was the dispatcher able to see driver's name change on the fleet status table?

YES ☐ NO ☑ N/A ☐

Explain: The fleet status table is only available to Cal Poly Pomona dispatchers and the table does not show the driver's name. Acting as a First Transit dispatcher, I was not able to monitor the driver's names during a shift change.

Was the operational scenario (3.3.2 DISPATCHERS KNOW WHERE VEHICLES ARE) executed successfully?

YES ☑ NO ☐ N/A ☐

Explain: The dispatcher was able to contact the driver via a phone and could also determine where the driver needing replacement was. The dispatcher was able to monitor the location of the drivers at all times. The only thing he or she was not able to see was the actual name change of the bus drivers. The drivers are able to log in and log out of the MDT

What worked?

Dispatchers are able to communicate with the drivers via a phone.
Dispatchers are able to monitor the location of all buses at all times.
Drivers were able to log in and out of the MDT.

What didn't work?

Dispatchers are not able to see a name change in a fleet status table because a fleet status table that displays the drivers name is not available.

3.3.3 DISPATCH BUS WITH SERIOUS MECHANICAL FAILURE

DATE: 1-29-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.3.3):

A State dispatcher is on duty. He receives a phone message from a Laidlaw dispatcher indicating there is a mechanical failure on a Laidlaw bus. The failed bus is stuck on the road and cannot continue to service Route C.

Both State and Laidlaw dispatchers look at the Bronco Express system map and find out the location where the failed bus is.

After talking with the driver of the failed bus using the radio system, the Laidlaw dispatcher believes the mechanical failure is a serious one. He decides to replace the failed bus by a substitute one.

The Laidlaw dispatcher updates the Fleet Status table and changes the status of the bus on Route C from “On Route” to “Mechanical failure; Replacement Bus Expected.” The change quickly appears on all EDAPTS system consoles (including the State dispatcher’s) and indicates that a vehicle problem is ongoing.

ROUTE	OPERATOR	STATUS	LAST STOP	NEXT STOP	LOADING
A-1	State Driver's Name	on route	Rose Garden	Building 1	15/24
A-2	Laidlaw Driver's Name	on route	Building	Rose Garden	7/24
B-1	Laidlaw Driver's Name	on break	Kellogg West	Collins School	0/24
B-2	Laidlaw Driver's Name	on route	Building 1	Rose Garden	4/16
C-1	Laidlaw Driver's Name	on route	Market Place	Environmental Design	6/24
C-2	Laidlaw Driver's Name	Mech. Failure; Replacement Bus Expected	Building 29	Building 89	0/16

The Laidlaw dispatcher informs the Service Manager in the Laidlaw repair shop of the bus failure and asks a temporary bus driver to drive the substitute bus to replace the failed bus. The temporary driver drives the substitute bus to Cal Poly Pomona.

Also he sends a mechanic to go with the temporary driver. The mechanic makes a thorough diagnosis of the failed bus and informs the Laidlaw dispatcher that a big tow truck is needed to get the failed bus into the repair shop. The Laidlaw dispatcher then sends a big tow truck to get the failed bus in the Laid Law's repair shop.

The Route C driver gets the replacement bus and logs in the EDAPTS system for the substitute bus. Once the login is successful, he updates the Route C's bus status within the Fleet Status table. The Fleet Status table then may look like the below one:

ROUTE	OPERATOR	STATUS	LAST STOP	NEXT STOP	LOADING
A-1	State Driver's Name	on route	Rose Garden	Building 1	5/24
A-2	Laidlaw Driver's Name	on route	Building	Rose Garden	8 /24
B-1	Laidlaw Driver's Name	on route	Kellogg West	Collins School	10/24
B-2	Laidlaw Driver's Name	on route	Building 1	Rose Garden	14/16
C-1	Laidlaw Driver's Name	on route	Market Place	Environmental Design	16/24
C-2	Laidlaw Driver's Name	on route	Building 29	Building 89	10/16

When the Fleet Status table shows the failed bus is replaced, both the State dispatcher and the Laidlaw dispatcher know how long the bus replacement takes. They simply push a button called "Incident Clearance Report" on their console. They know Route C has been out of service for 41 minutes.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide fleet status information in a map and table to State and Laidlaw dispatchers. (Previously validated, see Section 3.3.1)

2. The dispatcher is able to communicate with drivers via a dedicated radio channel. (Previously validated, see Section 3.3.2)

3. The system shall allow a Laidlaw dispatcher to change the status of buses on the Fleet Status Table.

4. The system shall allow a driver to log in the EDAPTS system for a substitute bus. (Previously validated, see Section 3.2.1)

5. Changes in the Fleet Status table appear on all EDAPTS system consoles. (Previously validated, see Section 3.3.1)

6. The system shall allow drivers to change the status of buses on the Fleet Status Table.

7. The system shall provide an "Incident Clearance Report" button that shows how long a

bus replacement takes.

VALIDATION PLAN

1. Observe dispatcher's activities to locate a failed bus, update the fleet status table, provide a replacement bus and show how long a bus replacement takes.

2. Create a data collection sheet (or map) that chronicles and details the dispatcher's ability to find and replace a failed bus and update the fleet status table.

3. Record observations about other factors and impressions. Required observations are:

    - Was the Laidlaw dispatcher able to change the status of buses on the Fleet Status Table?

    - Was the driver able to change the status of buses on the Fleet Status Table?

    - Did the "Incident Clearance Report" button provide the bus replacement time?

NOTES

Because of my knowledge of the MDT functions and the dispatch functions I decided that acting out this scenario would not be necessary. The answers to this test could be answered very easily.

From Section 3.3.1 I know that both dispatchers have access to a map that gives them access to the real-time location of every bus.

From Section 3.3.2 I know that First Transit dispatchers can contact their drivers via a phone and Cal Poly Pomona dispatchers can contact their drivers via a radio.

Since I am able to access both the First Transit and Cal Poly Pomona dispatcher's consoles I know that neither dispatcher is able to change the status of a bus via the Fleet Status Table. I also know that their consoles do not provide an "Incident Clearance Report" button.

Also, from Section 3.2.1 I know that the drivers are not able to change the status of their bus via the MDT.

VALIDATION RESULTS
Was the Laidlaw dispatcher able to change the status of buses on the Fleet Status Table? YES ☐ NO ☑ N/A ☐ Explain: Dispatchers are not able to change the status of buses on the Fleet Status Table.
Was the driver able to change the status of buses on the Fleet Status Table? YES ☐ NO ☑ N/A ☐ Explain: Drivers are not able to change the status of buses on the Fleet Status Table.
Did the "Incident Clearance Report" button provide the bus replacement time? YES ☐ NO ☑ N/A ☐ Explain: The dispatchers' consoles do not have an "Incident Clearance Report" button.
Was the operational scenario (3.3.3 DISPATCH BUS WITH SERIOUS MECHANICAL FAILURE) executed successfully? YES ☐ NO ☑ N/A ☐ Explain: Although a bus with a mechanical failure can be located and repaired or replaced if necessary, MDT and console functions that are not available to perform the envisioned functions of this scenario. The fleet status table cannot be modified to show that a bus has a major mechanical failure. The dispatchers are not able to see how long a bus is out of service.
What worked? Dispatchers are able to find the location of buses using a system map and are able to contact drivers via a phone or radio.
What didn't work? Neither the dispatchers nor drivers are able to change the status of buses on the Fleet Status Table. The dispatchers' consoles are not provided with an "Incident Clearance Report" button.

3.4 Managing Bronco Express Service

3.4.1 USING PASSENGER LOADING REPORTS TO OPTIMIZE VEHICLE SIZE

DATE: 1-29-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.4.1):

The Bronco Express manager has noticed that Route C often seems to have many standbys, regardless of time of day.

The manager selects the Ride Report section of the EDAPTS system console and selects the daily, monthly and yearly passenger loading reports for all routes. The reports list the peak loads, the peak hours and other temporal characteristics of all the service buses.

The manager uses this data to determine that the bus assigned to Route C often has 5 to 10 more people on-board than its capacity. He plans to use this information to help in his selection of the new bus that is planned for purchase that year.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a Ride Report section that shows the daily, monthly, and yearly passenger loading reports for all routes.

2. The system shall provide reports that show the peak loads, the peak hours, and other temporal characteristics of all the service buses.

VALIDATION PLAN

1. Observe manager's activity to view reports within the Ride Report section provided by the EDAPTS system.

2. Create a data collection sheet (or map) that chronicles and details the manager using the system's Ride Report section.

3. Record observations about other factors and impressions. Required observations are:

    - Was the Ride Report section provided by the system?

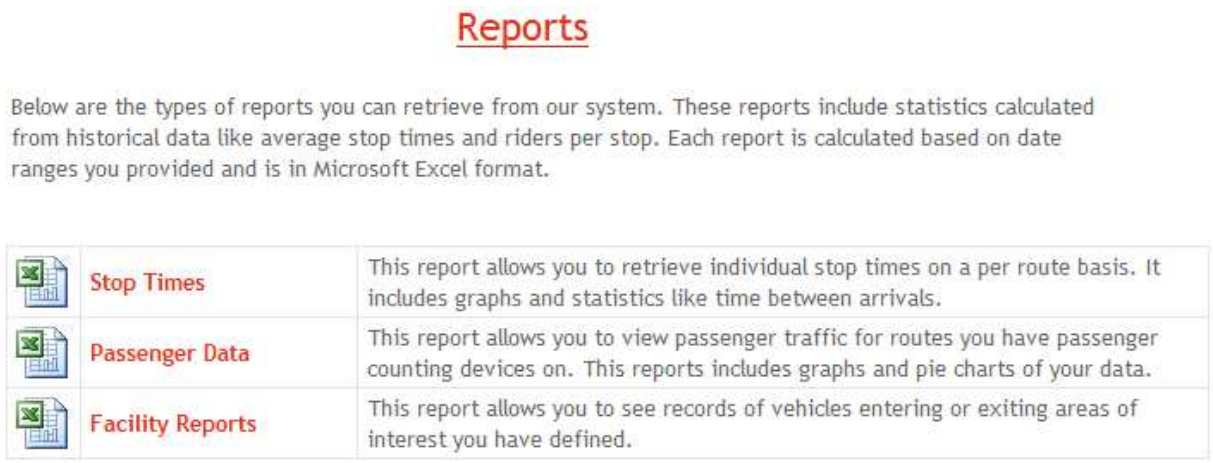
- Were the daily reports provided by the Ride Report section?

NOTES

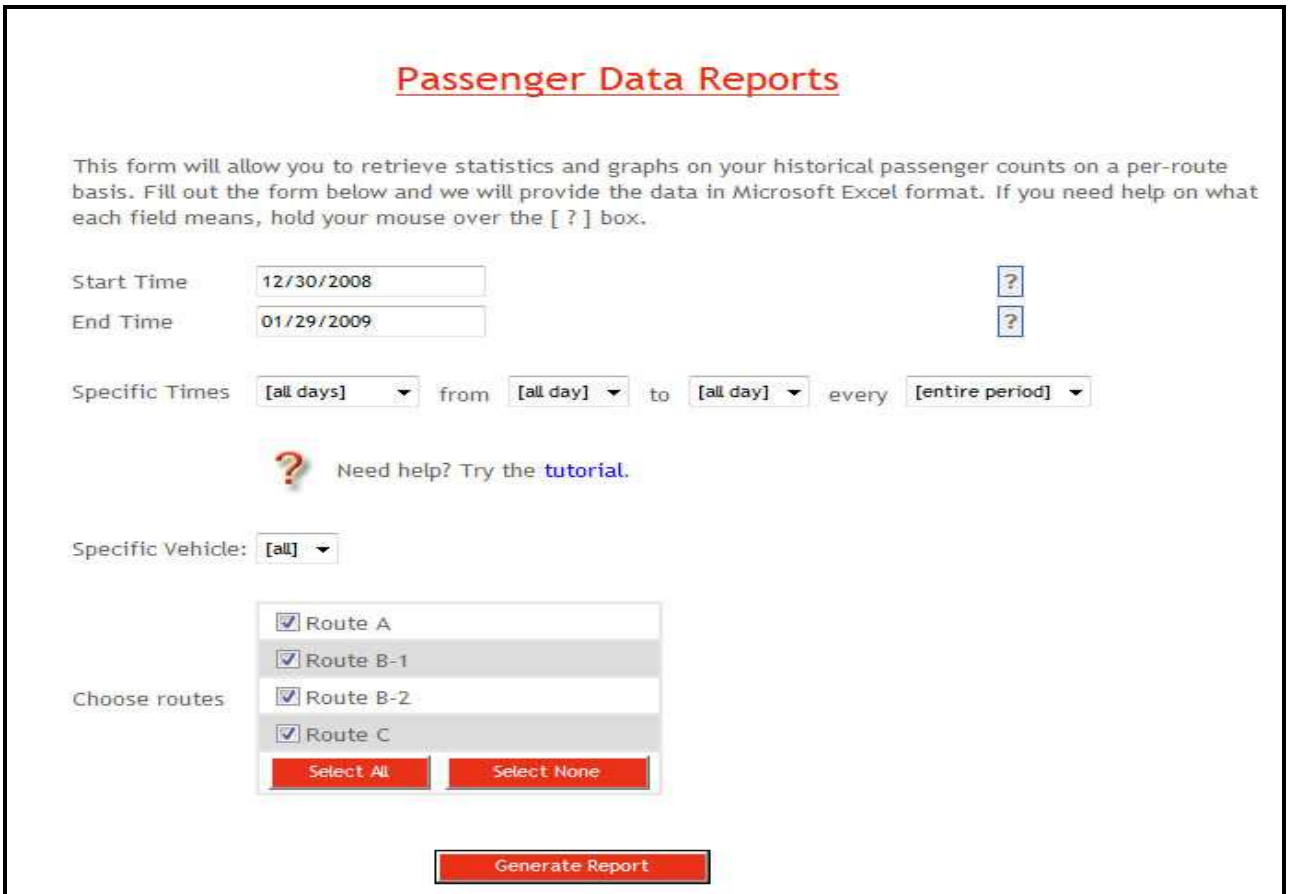
I was given administrator authorization to be able to access all of the features management would be able to access. In this scenario I am acting as a Bronco Express administrator.

The system provides many different reports to management. To access any of these reports a Bronco Express administrator goes to www.syncromatics.com and performs a login.

I logged into the website and went to the Reports tab the following information was displayed:


Reports
Below are the types of reports you can retrieve from our system. These reports include statistics calculated from historical data like average stop times and riders per stop. Each report is calculated based on date ranges you provided and is in Microsoft Excel format.
Stop Times
This report allows you to retrieve individual stop times on a per route basis. It includes graphs and statistics like time between arrivals.
Passenger Data
This report allows you to view passenger traffic for routes you have passenger counting devices on. This reports includes graphs and pie charts of your data.
Facility Reports
This report allows you to see records of vehicles entering or exiting areas of interest you have defined.

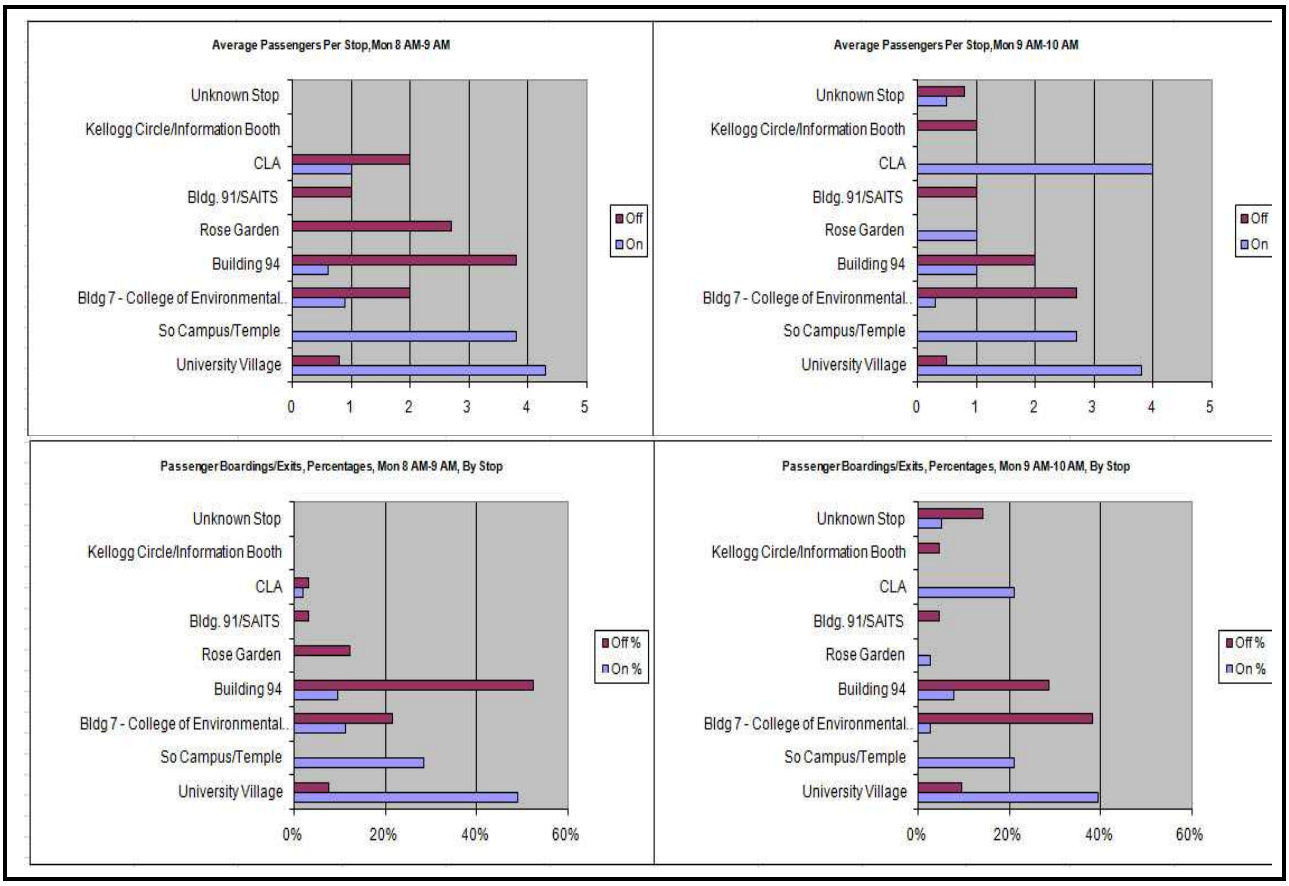
I clicked the Passenger Data report and received the following information:



For testing purposes I chose a Start Time of 12/30/2008 and an End Time or 1/29/2009. The Specific Times I chose was Mondays, 8AM to 4PM every 1 hour. The Specific Vehicle I chose was 199 and I chose Route A. The following information was available in an Excel spreadsheet:

Passenger Counts: Route A

Stop Name	Mon 8 AM-9 AM						Mon 9 AM-10 AM					
	Avg Per Stop		Total, Entire Period				Avg Per Stop		Total, Entire Period			
	On	Off	On	On %	Off	Off %	On	Off	On	On %	Off	Off %
University Village	4.3	0.8	26	49%	5	8%	3.8	0.5	15	39%	2	10%
So Campus/Temple	3.8	0	15	28%	0	0%	2.7	0	8	21%	0	0%
Bldg 7 - College of Environmental Desig	0.9	2	6	11%	14	22%	0.3	2.7	1	3%	8	38%
Building 94	0.6	3.8	5	9%	34	52%	1	2	3	8%	6	29%
Rose Garden	0	2.7	0	0%	8	12%	1	0	1	3%	0	0%
Bldg. 91/SAITS	0	1	0	0%	2	3%	0	1	0	0%	1	5%
CLA	1	2	1	2%	2	3%	4	0	8	21%	0	0%
Kellogg Circle/Information Booth	0	0	0	0%	0	0%	0	1	0	0%	1	5%
Unknown Stop	0	0	0	0%	0	0%	0.5	0.8	2	5%	3	14%
TOTALS			53		65				38		21	


Average Passengers Per Stop,Mon 8 AM-9 AM
Unknown Stop
Kellogg Circle/Information Booth
CLA
Bldg. 91/SAITS
Rose Garden
Building 94
Bldg 7 - College of Environmental..
So Campus/Temple
University Village
0
1
2
3
4
5
Off
On
Average Passengers Per Stop,Mon 9 AM-10 AM
Unknown Stop
Kellogg Circle/Information Booth
CLA
Bldg. 91/SAITS
Rose Garden
Building 94
Bldg 7 - College of Environmental..
So Campus/Temple
University Village
0
1
2
3
4
5
Off
On
Passenger Boardings/Exits, Percentages, Mon 8 AM-9 AM, By Stop
Unknown Stop
Kellogg Circle/Information Booth
CLA
Bldg. 91/SAITS
Rose Garden
Building 94
Bldg 7 - College of Environmental..
So Campus/Temple
University Village
0%
20%
40%
60%
Off %
On %
Passenger Boardings/Exits, Percentages, Mon 9 AM-10 AM, By Stop
Unknown Stop
Kellogg Circle/Information Booth
CLA
Bldg. 91/SAITS
Rose Garden
Building 94
Bldg 7 - College of Environmental..
So Campus/Temple
University Village
0%
20%
40%
60%
Off %
On %

VALIDATION RESULTS

Was the Ride Report section provided by the system?

YES ☑ NO ☐ N/A ☐

Explain: It was not labeled Ride Report; it was labeled Passenger Data in the Reports section and it provided the same information.

Did the Ride Report contain information showing daily, monthly and yearly passenger loading for all routes?

YES ☑ NO ☐ N/A ☐

Explain: Depending on the selections you make you can get the needed information.

Did the Ride Report contain information showing peak loads, the peak hours and other temporal characteristics of all the service buses?

YES ☑ NO ☐ N/A ☐

Explain: Excel graphs provided excellent examples of peaks.

Was the operational scenario (3.4.1 USING PASSENGER LOADING REPORTS TO OPTIMIZE VEHICLE SIZE) executed successfully?

YES ☑ NO ☐ N/A ☐

Explain: The Bronco Express administrator was able to access information regarding daily, monthly and yearly passenger loading reports for all routes. He was also able to access information regarding the peak loads, the peak hours and other temporal characteristics of all the service buses.

What worked?

The Bronco Express manager was able to access reports regarding passenger-loading information that will help him/her optimize vehicle size.

What didn't work?

N/A

3.4.2	USING SCHEDULE ADHERENCE REPORTS TO ADJUST SCHEDULE (POTENTIAL FUTURE FEATURE)
DATE: 1-30-09	**TESTER(S):** Ryan Beasley
FACILITATOR(S):	

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.4.2):

The Bronco Express manager has heard complaints from student representatives of the Associated Students, Inc. (ASI) that the bus schedule does not provide adequate service at the new parking structure opened recently. The manager recalls that the EDAPTS system has a tool to help him adjust schedules based on the actual travel times experienced.

The manager clicks the Schedule section of the EDAPTS console. He selects the Adjust button.

The EDAPTS system provides him with a recommended new bus schedule. The adjusted schedule is developed based on the statistical patterns of the actual travel time of buses on that route.

The manager prints out the revised schedule and compares it with the one currently used for the Bronco Express. He feels the revised one reflects the traffic impacts of the new parking structure. He decides to adopt the revised schedule and implement it in the Bronco Express.

He simply selects the revised schedule and pushes the "ACCEPT" button. The Bronco Express bus serving that route is then placed on the revised schedule via the normal schedule adjustment process.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a Schedule Adjustment function.
2. The system shall provide the manager with a recommended new bus schedule.
3. The system shall allow the manager to print out the recommended new bus schedule.
4. The system shall allow the revised schedule to be accepted and replaced by pressing a button.

VALIDATION PLAN

1. Observe manager's activities to manage bus schedules within the Schedule section

provided by the EDAPTS system.

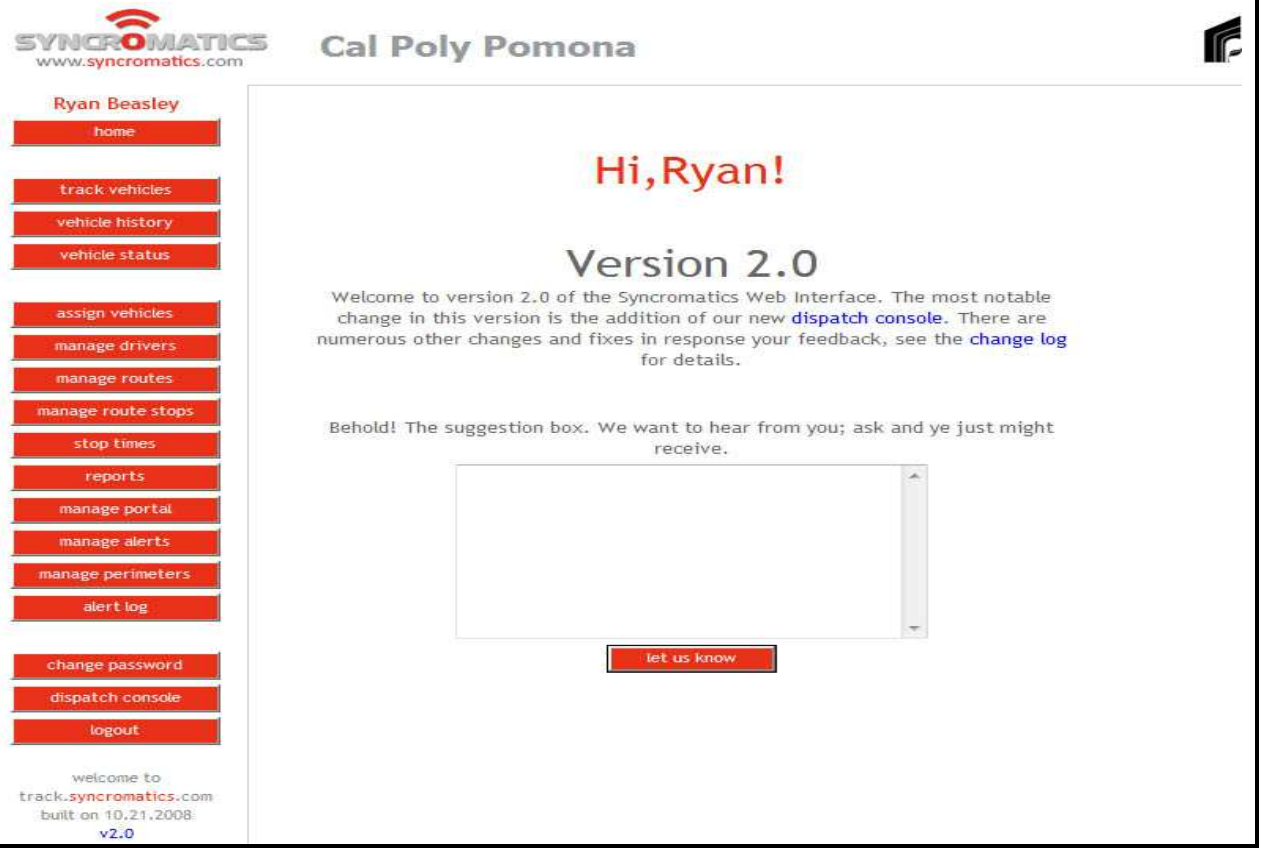
2. Create a data collection sheet (or map) that chronicles and details the manager's procedures to manage the schedule of a bus using the EDAPTS system.

3. Record observations about other factors and impressions. Required observations are:

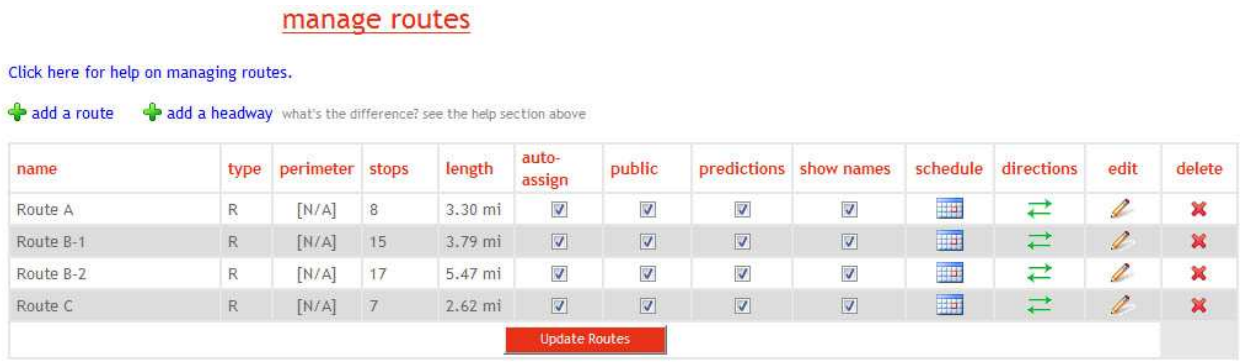
    - Was the Schedule function provided by the system?
    - Was the Adjust function provided by the system?
    - Did the system automatically generate a new recommended schedule based on the statistical patterns of the actual travel time of buses on that route?
    - Was the system able to print the recommended new bus schedule?
    - Did the system accept the new bus schedule when authorized by the manager?
    - Was the previous schedule replaced by the revised schedule?

NOTES

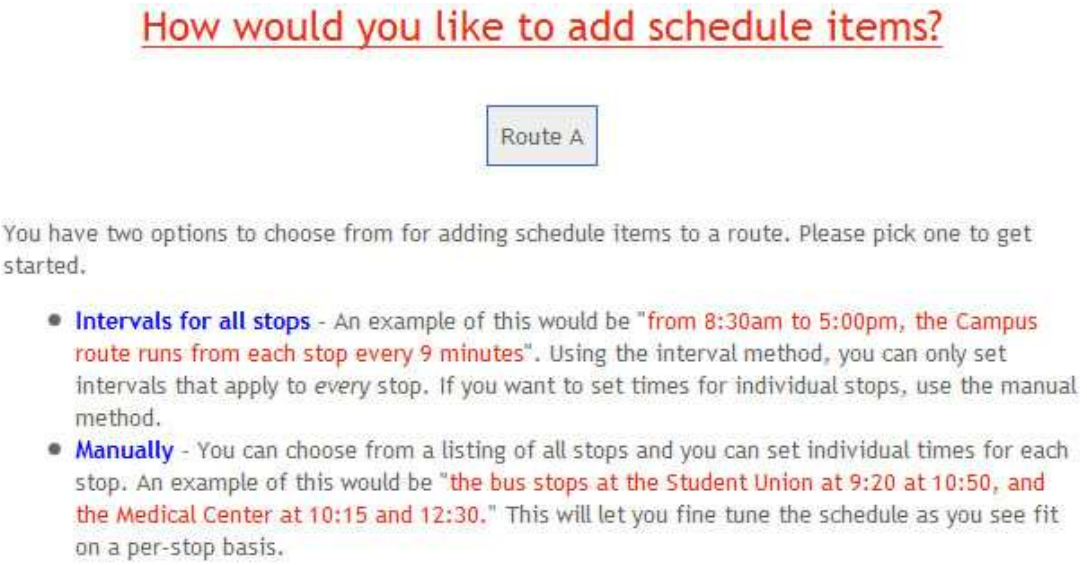
The main screen for a Bronco Express manager looks like the following:



Here an administrator can manage route and route stops.



There is Schedule section within the Manage Routes section where an administrator can either add a schedule manually or add an interval for all stops.


How would you like to add schedule items?
Route A
You have two options to choose from for adding schedule items to a route. Please pick one to get started.
Intervals for all stops - An example of this would be "from 8:30am to 5:00pm, the Campus route runs from each stop every 9 minutes". Using the interval method, you can only set intervals that apply to every stop. If you want to set times for individual stops, use the manual method.
Manually - You can choose from a listing of all stops and you can set individual times for each stop. An example of this would be "the bus stops at the Student Union at 9:20 at 10:50, and the Medical Center at 10:15 and 12:30." This will let you fine tune the schedule as you see fit on a per-stop basis.

In the Intervals for all stops section an administrator can specify an interval for the stop times during any time and day.

Add Schedule Items for Route A

An interval schedule lets define how often you expect your buses to departing from each stop. Here's how you can use the controls below to add schedule items:

1. Specify an interval (i.e., every 10 minutes) to insert stop times for.
2. Pick a start and end time.
3. Specify whether to add weekday times, Saturday times, or Sunday times.
4. Repeat as many times as you need to in order to define the schedule

PLEASE heed the following instructions:

- When you define intervals, they apply to all stops. If you want to set times on a per-stop basis, use a manual schedule.
- The form will not let you insert duplicate times. You need to choose a period that doesn't already contain time items.
- If you need to add more than 4 intervals, just add the first 4 and you can fill out the form again.

Add Schedule Items

Every [select] minutes, from -- : -- -- to -- : -- --
Weekday Saturday Sunday

Every [select] minutes, from -- : -- -- to -- : -- --
Weekday Saturday Sunday

Every [select] minutes, from -- : -- -- to -- : -- --
Weekday Saturday Sunday

Every [select] minutes, from -- : -- -- to -- : -- --
Weekday Saturday Sunday

OK, add the schedule items

In the Manually Section an administrator can add times when a bus will arrive at a stop.

Weekday schedule for Route B-2 proposal

Show me the schedule for: Weekday Saturday Sunday

To add a time to a stop, click the + icon on the stop.

NOTE: You are using a manual schedule. If you want to set up an interval schedule (example: "from 8:30am to 5:00pm, the Campus route runs from each stop every 9 minutes"), you need to use the red X below each stop to delete the manual data first.

Collins School	Kellogg West	College of Environmental Design	Building 94	Rose Garden	SAITS	CLA	Interim Design Ctr.	Parking Structure	Student Health Services
✖ ✚	✖ ✚	✖ ✚	✖ ✚	✖ ✚	✖ ✚	✖ ✚	✖ ✚	✖ ✚	✖ ✚
08:15AM ✖	08:17AM ✖	08:19AM ✖	08:21AM ✖	08:22AM ✖	08:23AM ✖	08:24AM ✖	08:27AM ✖	08:29AM ✖	08:31AM ✖

There is not a section that provides an administrator with a recommended schedule based on the statistical patterns of the actual travel time of buses on a route.

VALIDATION RESULTS
Was the Schedule function provided by the system? YES ☑ NO ☐ N/A ☐ Explain: A schedule section was provided.
Was the Schedule Adjust function provided by the system? YES ☑ NO ☐ N/A ☐ Explain: There are two sections within the Schedule section where schedules can be adjusted; the Intervals for all stop and Manually sections.
Did the system automatically generate a recommended new schedule? YES ☐ NO ☑ N/A ☐ Explain: The system does not recommend any schedules.
Was the manager able to print the recommended new bus schedule? YES ☐ NO ☐ N/A ☑ Explain: There was not a recommended new bus schedule to print.
Did the system accept the new bus schedule when authorized by the manager? YES ☐ NO ☐ N/A ☑ Explain: There is not a new bus schedule authorization button, when an administrator creates a new schedule the system accepts it as long as the he/she saves the changes.
Was the previous schedule replaced by the revised schedule? YES ☐ NO ☐ N/A ☑ Explain: There is no replacement of schedules function. Administrators must manually change a schedule by either deleting and creating a new schedule or modifying a current schedule.
Was the operational scenario (3.4.2 USING SCHEDULE ADHERENCE REPORTS TO ADJUST SCHEDULE [POTENTIAL FUTURE FEATURE]) executed successfully?

YES ☐ NO ☑ N/A ☐ Explain: An administrator is able to change route schedules, but the system does not automatically recommend a new schedule.
What worked? Administrators are able to create and edit bus schedules.
What didn't work? The system did not provide a section that would recommend a schedule based on the statistical patterns of the actual travel time of buses on a route.

3.5 Laidlaw Management Tasks

3.5.1 PROVIDING THE MONTHLY REPORT TO CAL POLY

DATE: 1-30-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.5.1):

The Laidlaw Transit Services manager logs into the EDAPTS system and selects Ride Reports on the console.

He enters a start date and an end date for the reporting period, selects routes to include in the report, and selects 1) passengers boarding at each stop by month and 2) total passenger counts by month.

The manager then selects the output report format as CSV (comma separated variable) rather than Adobe PDF. With all selections and parameters entered, the manager hits the "RUN REPORT" button on the console.

A monthly report that satisfies Cal Poly Pomona reporting requirements is automatically generated. The manager prints the report, makes a copy for himself, and mails it to Cal Poly Pomona Parking and Transportation Services.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a Ride Report section that shows the passengers boarding at each stop by month and total passenger counts by month.
2. The system shall allow a manager to select the output report format.
3. The system shall provide a "RUN REPORT" button to print the report generated by the Ride Report section.

VALIDATION PLAN

1. Observe manager's procedures to specify parameters and print out a passenger boarding report showing boarding at each stop by month and total passenger counts by month by using the Ride Report section.
2. Create a data collection sheet (or map) that chronicles and details the manager's procedures to print out passenger boarding at each stop by month and total passenger

counts by month by using the Ride Report section.

3. Record observations about other factors and impressions. Required observations are:

   - Did the Ride Report section generate the passenger boarding at each stop by month and total passenger counts by month?
   - Did the system allow a manager to select the output report format?
   - Was the "RUN REPORT" button provided by the system?
   - Did the "RUN REPORT" button print the passenger boarding report?

NOTES

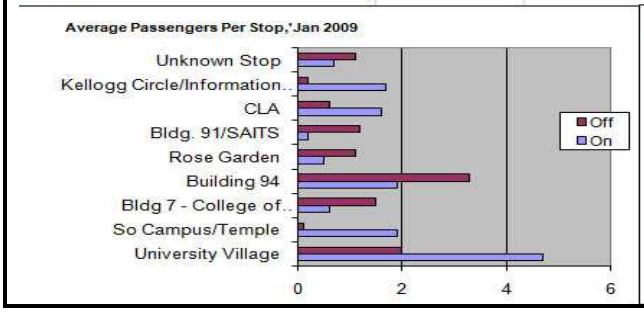
The System provides a function that allows an administrator to view passenger loading information. You can choose 1 day, 1 month, and so on for the period of interest. You can also select specific times of the day between 12 AM to 11 PM. You can choose the day, the vehicles and the routes.

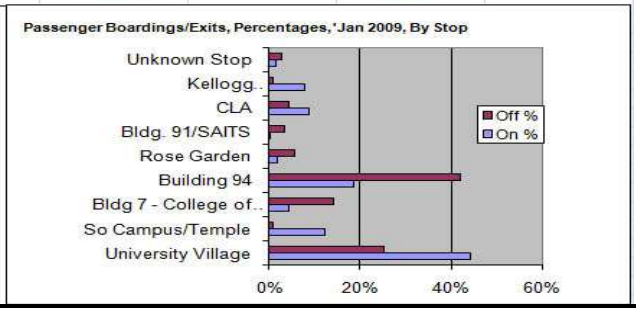
The reports are generated in Excel format. They can be printed, saved, emailed and faxed.

For this scenario I logged into www.syncromatics.com and was able to access the reports section. Here I set the date from 1-1-2009 to 1-30-2009. I selected weekdays from all day to all day, specified vehicle 199 and route A. I obtained the following information:

Passenger Counts: Route A

Stop Name	Total Passengers By Stop					
	Jan 2009					
	Avg Per Stop		Total, Entire Period			
	On	Off	On	On %	Off	Off %
University Village	4.7	2	1160	44%	509	25%
So Campus/Temple	1.9	0.1	323	12%	20	1%
Bldg 7 - College of Environmental Design	0.6	1.5	117	4%	285	14%
Building 94	1.9	3.3	492	19%	850	42%
Rose Garden	0.5	1.1	47	2%	112	6%
Bldg. 91/SAITS	0.2	1.2	11	0%	71	4%
CLA	1.6	0.6	233	9%	90	4%
Kellogg Circle/Information Booth	1.7	0.2	208	8%	22	1%
Unknown Stop	0.7	1.1	38	1%	59	3%
TOTALS			2629		2018	





VALIDATION RESULTS

Was the manager able to specify that the Ride Report section generate the passenger boarding at each stop by month?

YES ☑ NO ☐ N/A ☐

Explain: There was an option provided to select the period of the report.

Was the manager able to specify that the Ride Report section generate the total passenger counts by month?

YES ☑ NO ☐ N/A ☐

Explain: Total counts were provided in the report.

Did the system allow a manager to select the output report format?

YES ☐ NO ☑ N/A ☐

Explain: The format was always an Excel document.

Was the "RUN REPORT" button provided by the system?

YES ☑ NO ☐ N/A ☐

Explain: There was a "GENERATE REPORT" button that allowed the information to be available in an Excel document.

Did the "RUN REPORT" button print the passenger boarding report?

YES ☐ NO ☑ N/A ☐

Explain: The document did not automatically print when the button was pressed, but it can be printed using normal software menu functions if it is desired.

Was the operational scenario (3.5.1 PROVIDING THE MONTHLY REPORT TO CAL POLY) executed successfully?

YES ☑ NO ☐ N/A ☐

Explain: Administrators were able to access passenger loading information. There were also able to specify the exact time period of interest. The information was provided in an Excel document and could be printed if it needed to.

What worked? The manager was able to view a monthly report that showed information regarding total passenger counts.
What didn't work? The manager was not able to select the output format of the report.

3.6 Maintaining EDAPTS System

3.6.1 SCHEDULE AND ROUTE UPDATES

DATE: 2-5-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.1):

An administrative assistant working for PTS maintains the Bronco Express schedule. His work includes analyzing schedule adherence reports generated by the EDAPTS system, looking at requirements for adding new stops, changing existing stops or removing stops. Typically, this information is used to generate revised route maps for the system and that is what he's doing today.

After the assistant has finalized a (recommended) new system schedule, he then logs into the EDAPTS system as a schedule manager. In this role, he is able to modify (and authorize) route timetables for the system and create a new schedule.

Upon creation of this electronic version of the schedule, the assistant hits a button that automatically deploys the schedule to all Mobile Data Terminals (MDTs) and real-time bus arrival signs in the fleet. There is no need to send a service technician out to the buses or signs in order to do the update.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall allow an assistant to develop recommended route timetables for the system.
2. The system shall allow a schedule manager to authorize and modify route timetables for the system and create new schedules.
3. The system shall provide a button that automatically deploys the schedule to all Mobile Data Terminals (MDTs) and real-time bus arrival signs in the fleet.

VALIDATION PLAN

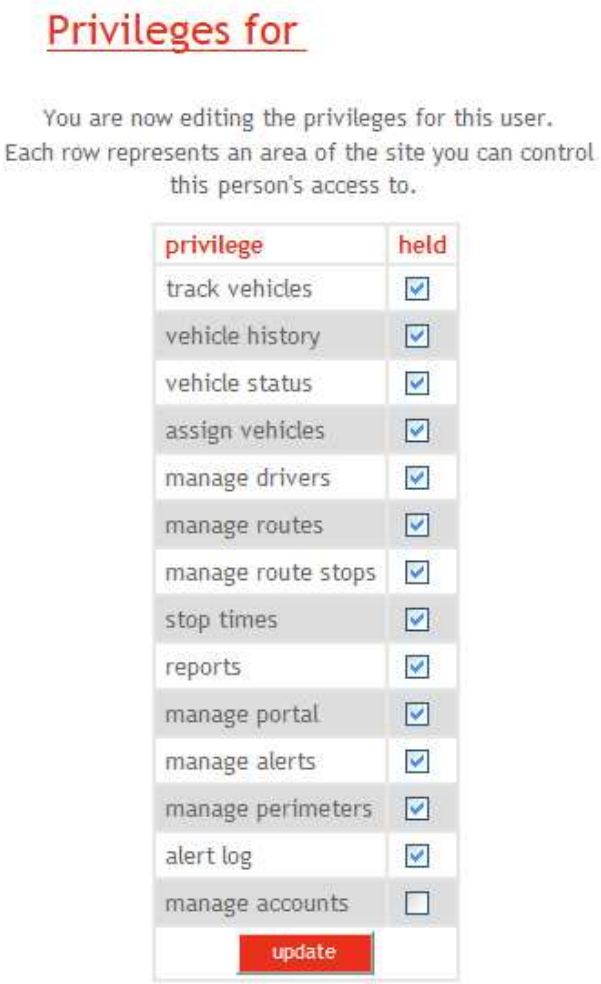
1. Observe an administrative assistant's activities to develop recommended modifications to route timetables and submit the changes to a manager for approval.
2. Create a data collection sheet (or map) that chronicles and details the administrative assistant's activities to modify route timetables for the system, create a new schedule

and submit the changes to all MDTs and real-time bus arrival signs in the fleet.

3. Record observations about other factors and impressions. Required observations are:
    - Did the system provide the feature for an administrative assistant to modify and recommend new route timetables?
    - Did the system provide the feature for an administrative manager to authorize a schedule change?
    - Did the system provide a button that automatically deploys the schedule to all MDTs and real-time bus arrival signs in the fleet?

NOTES

When an administrator adds a user into the system he/she is able to set the privileges for that user.



It can be seen in Section 3.4.2 that anyone with the correct authorization could add or edit a

route timetable.

VALIDATION RESULTS

Was the administrative assistant able to modify and recommend route timetables for the system?

YES ☑ NO ☐ N/A ☐

Explain: The assistant is able to modify and recommend route timetable as long as he/she has the right authorization.

Was the administrative assistant able to create a new schedule?

YES ☑ NO ☐ N/A ☐

Explain: The assistant is able to create a new schedule.

Did the system provide the feature for an administrative manager to authorize a schedule change?

YES ☑ NO ☐ N/A ☐

Explain: The assistant can add new schedules as proposals that can be later authorized by an administrative manager.

Did the system provide the feature for the administrative assistant to submit a schedule change to all MDTs?

YES ☐ NO ☑ N/A ☐

Explain: The schedules are not loaded into the MDTs.

Did the system provide the feature for the administrative assistant to submit a schedule change to all real-time bus arrival signs in the fleet?

YES ☐ NO ☐ N/A ☑

Explain: The arrival sign's predictions are not based on any type of predetermined schedule. If a new route is added to a sign, the sign will automatically show the estimated arrival time for the new route.

Was the operational scenario (3.6.1 SCHEDULE AND ROUTE UPDATES) executed successfully?

YES ☑ NO ☐ N/A ☐

Explain: An administrative assistant is able to develop, modify and edit route timetables and schedules. Signs are automatically updated with new routes but MDTs do not have route information.
What worked? An administrative assistant is able to modify route time tables and create new schedules. Signs are updated with new route information.
What didn't work? MDT does not incorporate support for route schedule information.

3.6.2 ADDITION OF NEW STOPS ON A ROUTE

DATE: 2-5-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.2):

An administrative assistant working for PTS needs to create a new stop in the system as part of creating a new schedule.

He coordinates with Laidlaw to have a driver survey the new stop.

The driver assigned to the task drives to the new stop location and sets his Mobile Data Terminal (MDT) into Stop Survey mode, which reports the GPS coordinates to the driver.

The driver records these coordinates on the Stop Survey Form and reports them to the administrative assistant later that day.

The assistant uses the schedule tool in the EDAPTS system to create a new stop, entering the GPS coordinates from the Stop Survey Form when prompted to do so. The schedule tool then creates a new schedule utilizing the newly created stop.

Upon creation of this electronic version of the schedule, the assistant hits a button that automatically deploys the schedule to all Mobile Data Terminals and real-time bus arrival signs in the fleet.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The MDT provides a Stop Survey mode, which reports the GPS coordinates to the driver.
2. A Stop Survey Form shall be provided for recording GPS coordinates.
3. The system shall provide a schedule tool, which allows an administrative assistant to create a new stop by entering the GPS coordinates from the Stop Survey Form.
4. The schedule tool shall create a new schedule utilizing a newly created stop.
5. The system shall provide a button that automatically deploys the schedule to all Mobile Data Terminals (MDTs) and real-time bus arrival signs in the fleet.(Previously validated, see Section 3.6.1)

VALIDATION PLAN

1. Monitor the driver's procedures of using the Stop Survey mode of MDT to report the GPS coordinates and entering the coordinates onto the Stop Survey Form.

2. Observe an administrative assistant's activities to create a new stop using GPS coordinates and create a new schedule utilizing the new stop.

3. Create a data collection sheet (or map) that chronicles and details the driver's and administrative assistant's procedures of creating a new stop.

4. Record observations about other factors and impressions. Required observations are:

    - Did the MDT provide a Stop Survey Mode, which reported the GPS coordinates to the driver?

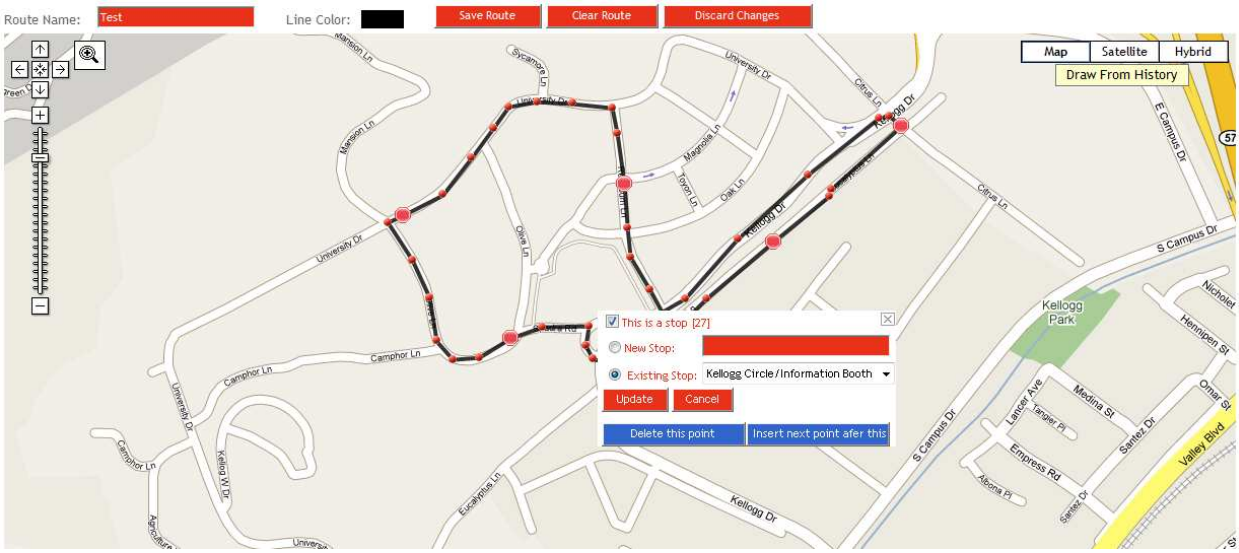
    - Was a Stop Survey Form provided to allow the driver to record the reported GPS coordinates?

    - Did the schedule tool allow the administrative assistant to create a new stop with previously recorded GPS coordinates?

    - Did the schedule tool create a new schedule utilizing the newly created stop?

NOTES

GPS coordinates are not required to add a new stop and adding stops to a route is fairly simple and looks like the following:



You simply click on the map to draw the route, go to the points that you want to be a stop,

check the “This is a stop” box and you can either create a new stop or add it to an existing stop.

MDT does not support a stop survey mode.

VALIDATION RESULTS
Did the MDT provide a Stop Survey Mode, which reported the GPS coordinates to the driver? YES ☐ NO ☐ N/A ☑ Explain: This was not needed because GPS coordinates are not needed to create a new stop.
Was a Stop Survey Form provided to allow the driver to record the reported GPS coordinates? YES ☐ NO ☐ N/A ☑ Explain: N/A
Did the schedule tool allow the administrative assistant to create a new stop with previously recorded GPS coordinates? YES ☐ NO ☑ N/A ☐ Explain: GPS coordinates cannot be entered to create a new stop. In order to create a new stop the assistant must click on a map representation.
Did the schedule tool create a new schedule utilizing the newly created stop? YES ☐ NO ☑ N/A ☐ Explain: There is no schedule provided.
Was the operational scenario (3.6.2 ADDITION OF NEW STOPS ON A ROUTE) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: Although many of the anticipated features in this scenario were not provided, they were also not needed to add a stop. The addition of new stops on a route is a simple click-n-add process.
What worked? Stops can be added to the route.
What didn't work? The MDT did not provide a Stop Survey Mode. A Stop Survey Form was not provided.

3.6.3 ON-BOARD HARDWARE MAINTENANCE

DATE: 3-9-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.3):

A maintenance technician is assigned to maintain EDAPTS system hardware. According to the EDAPTS maintenance manual, the technician needs to periodically test all EDAPTS hardware to ensure complete and proper function. If a hardware device does not work, he needs to conduct on-site troubleshooting, repair and replace damaged or failed components. He also needs to work with the vendors of the EDAPTS system to get sufficient spare hardware.

One day, around 9:30 AM, he receives a radio message from the Laidlaw dispatcher indicating that the MDT does not work on the bus that serves Route B.

He looks the Bronco Express system map and knows when and where he can intercept the problem bus.

He goes onto the bus and diagnoses a failed MDT. He finds that the MDT has an electrical problem. He needs to replace it by a spare one. He quickly de-mounts the failed MDT and re-mounts the spare one.

He conducts a serious of testing on the replaced MDT and ensures all the EDAPTS components related to the MDT are working properly.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide an EDAPTS maintenance manual.
2. The Laidlaw dispatcher shall be able to communicate with maintenance technicians through radios.
3. The system shall provide a Bronco Express system map. (Previously validated, see Section 3.3.1)
4. The MDTs shall be easily de-mounted and re-mounted by maintenance technicians.

VALIDATION PLAN

1. Observe a maintenance technician's activities to locate a bus using the system map,

diagnose failed MDTs, replace failed MDTs and ensure the newly replaced MDT works properly.

2. Create a data collection sheet (or map) that chronicles and details the maintenance technician's procedures for replacing and diagnosing failed MDTs.

3. Record observations about other factors and impressions. Required observations are:

    - Did the system provide an EDAPTS maintenance manual?
    - Was the Laidlaw dispatcher able to communicate with maintenance technicians through radios?
    - Was the maintenance technician able to de-mount a failed MDT?
    - Was the maintenance technician able to re-mount a spare MDT?
    - Was the replaced MDT fully-functional?

NOTES

The contractor provided several user manuals including an MDT user manual.

The Cal Poly Pomona dispatchers are able to communicate with maintenance technicians through radios.

The MDT is easy to de-mount and re-mount but the user manual does not provide detailed instructions on how to de-mount and re-mount.

Also, the MDT user manual does not provide testing procedures to ensure that the MDT is working properly, but the testing can be done given the simplicity of the MDT.

VALIDATION RESULTS
Did the system provide an EDAPTS maintenance manual? YES ☑ NO ☐ N/A ☐ Explain: An MDT User's Manual was provided.
Was the Laidlaw dispatcher able to communicate with maintenance technicians through radios? YES ☐ NO ☑ N/A ☐ Explain: Cal Poly Pomona dispatchers are able to communicate with maintenance technician through radios, but First Transit dispatchers cannot.
Was the maintenance technician able to de-mount a failed MDT? YES ☑ NO ☐ N/A ☐ Explain: The MDT can be easily de-mounted.
Was the maintenance technician able to re-mount a spare MDT? YES ☑ NO ☐ N/A ☐ Explain: The MDT can be easily mounted.
Was the replaced MDT fully-functional? YES ☑ NO ☐ N/A ☐ Explain: Diagnostic testing for a fully-functional MDT can be easily completed given the simplicity of the MDT.
Was the operational scenario (3.6.3 ON-BOARD HARDWARE MAINTENANCE) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: A maintenance technician can easily de-mount and re-mount an MDT and can also test an MDT for full-functionality. Cal Poly Pomona dispatchers can communicate with maintenance technicians but First Transit dispatchers cannot.
What worked?

A maintenance manual was provided. A maintenance technician can easily de-mount and re-mount an MDT. MDTs can be tested for full functionality.
What didn't work? First Transit dispatchers are not able to communicate with maintenance technicians through radios.

3.6.4 DISPATCH CONSOLE MAINTENANCE

DATE: 3-9-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.4):

A computer technician is assigned to maintain the EDAPTS dispatch console(s). According to the EDAPTS maintenance manual, the technician needs to periodically test all EDAPTS software to ensure complete and proper function. If a malfunction occurs on an EDAPTS dispatch console, he needs to conduct troubleshooting and repair damaged or failed functions. He is responsible for installing any necessary EDAPTS or base operating system software and conducting security updates when the updates become available. He also needs to periodically back up and expunge EDAPTS databases.

One day, around 10:00 AM, the technician receives a phone call from the State dispatcher saying that the dispatch console has some problems. The Bronco Express system map cannot appear on the dispatch console.

The technician goes to the dispatcher's office and finds out that the Bronco Express system map file has been somehow deleted.

He reinstalls the EDAPTS dispatch console software, tests all the EDAPTS dispatching functions and makes sure all the functions work fine.

The dispatcher is happy with the quick response from the technician.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide an EDAPTS maintenance manual. (Previously validated, see Section 3.6.3)

2. The system provides EDAPTS dispatch console software that can be reinstalled by a computer technician.

VALIDATION PLAN

1. Observe a computer technician's activities to reinstall the EDAPTS dispatch console software and test all the EDAPTS dispatching functions.

2. Create a data collection sheet (or map) that chronicles and details the computer

technician's procedures for reinstalling the EDAPTS dispatch console software.

3. Record observations about other factors and impressions. Required observations are:
    - Was the computer technician able to reinstall the EDAPTS dispatch console software?
    - Were all the EDAPTS dispatching functions working?

NOTES

The dispatch console is a web interface; there is no software needed to be installed for the dispatch console to work properly.

If the dispatch console fails to work properly Cal Poly Pomona personnel must report the problem to the contractor.

The contractor engages proactive monitoring of all their connected services including vehicle equipment, signs and the web portal; it is unlikely that Cal Poly will notice a systemwide failure before the contractor will.

The Track Website User Manual provides detailed information on each function that is provided by the contractor, but there is no troubleshooting section.

VALIDATION RESULTS
Was the computer technician able to reinstall the EDAPTS dispatch console software? YES ☐ NO ☐ N/A ☑ Explain: No software needs to be installed for the dispatch console to work properly.
Were all the EDAPTS dispatching functions working? YES ☑ NO ☐ N/A ☐ Explain: Using the Track Website User Manual it is easy to determine if an EDAPTS dispatching function was not working.
Was the operational scenario (3.6.4 DISPATCH CONSOLE MAINTENANCE) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: If a problem occurs with the dispatch console Cal Poly Pomona is only responsible for contacting the contractor.
What worked? The Track Website User Manual allows a technician to ensure all functions provided by the contractor are working properly.
What didn't work? N/A

3.6.5 VEHICLE TO CENTRAL DISPATCH COMMUNICATION LINK FAILS

DATE: 3-9-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.5):

A computer technician receives a call from the PTS Bronco Express Shuttle Service Manager saying that

a) All dispatch and administrative consoles indicate: “No Current Fleet Data Available”.
b) All Web-interfaces and transit signs indicate: “No Current Fleet Data Available, Please Consult Schedule.”

The CPP EDAPTS technician investigates the problem to determine a cause of failure. He is aware that these could include failed communications or computer equipment. He has a comprehensive User’s Manual that includes troubleshooting guidelines and various system diagnostic tools to assist in assessing problems. He also notifies the communications system provider to assist in troubleshooting.

Once he has located the failure, he utilizes an available cache of spare parts and makes the required repair. Prior to finishing, the technician ensures all consoles, signs, and Web-interfaces are working properly.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a User’s Manual that includes troubleshooting guidelines and various system diagnostic tools to assist in assessing problems.

2. The CPP EDAPTS technician shall be able to locate the failed communication or computer equipment and make the required repair.

VALIDATION PLAN

1. Observe a CPP EDAPTS technician’s activities to locate and repair failed equipment.

2. Create a data collection sheet (or map) that chronicles and details the CPP EDAPTS technician’s procedures including using the User’s Manual to locate the failed communication or computer equipment, repairing the failure and ensuring all consoles, signs, and Web-interfaces are working properly.

3. Record observations about other factors and impressions. Required observations are:

- Did the system provide a User's Manual that includes troubleshooting guidelines and various system diagnostic tools to assist in assessing problems?
- Was the CPP EDAPTS technician able to locate the failed equipment?
- Was the CPP EDAPTS technician able to repair the failed equipment?
- Were all consoles, signs and Web-interfaces working properly after the repair?

NOTES

The User Manuals provided by the contractor do not provide troubleshooting guidelines for the signs, web-interfaces, or dispatch consoles.

If all dispatch and administrative consoles indicate: "No Current Fleet Data Available" and all Web-interfaces and transit signs indicate: "No Current Fleet Data Available, Please Consult Schedule." Cal Poly Pomona will contact the contractor.

The contractor's response to this scenario is the following:

> **A systemwide failure such as this is a level 1 issue and we will respond within minutes 24x7. Further, if any vehicle, sign or web interface is out of order Cal Poly personnel should contact us immediately.**

VALIDATION RESULTS
Did the system provide a User's Manual that includes troubleshooting guidelines and various system diagnostic tools to assist in assessing problems? YES ☐ NO ☑ N/A ☐ Explain: The User's Manuals did not provide troubleshooting guidelines or system diagnostic tools for this scenario.
Was the CPP EDAPTS technician able to locate the failed equipment? YES ☐ NO ☐ N/A ☑ Explain: The contractor is responsible for this.
Was the CPP EDAPTS technician able to repair the failed equipment? YES ☐ NO ☐ N/A ☑ Explain: The contractor is responsible for this.
Were all consoles, signs and Web-interfaces working properly after the repair? YES ☐ NO ☐ N/A ☑ Explain: The contractor is responsible for this.
Was the operational scenario (3.6.5 VEHICLE TO CENTRAL DISPATCH COMMUNICATION LINK FAILS) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: Given the contractor's history with system repairs, any systemwide problem like this will be fixed immediately.
What worked? The contractor is able to locate and repair failed equipment. The contractor is able to test that all functions were working properly after the repair.
What didn't work? The User's Manuals did not provide troubleshooting guidelines or system diagnostic tools.

3.6.6 ON-BOARD EQUIPMENT FAILS

DATE: 3-9-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.6):

The driver on Route B notices a message on the MDT indicating that the automatic passenger counter (APC) has failed.

The driver attempts to correct the system error by cycling system power OFF and then back ON. After doing this, the system error still exists and the driver calls dispatcher to inform them that an on-board equipment failure exists. The MDT is still partially operational and has an active communications link, so the driver uses the MDT controls to send a "Failed On-Board Component" message to dispatcher.

The CPP EDAPTS technician is dispatched to the bus with supply of spare parts and diagnostic tools to determine if the problem can be quickly rectified via removal and replacement of parts or by a system reconfiguration. The technician is unable to do an on-route repair, so the problem is noted in system log and the technician returns to the shop.

That night, the technician locates the problem, replaces the failed parts and generates the Return To Vendor (RTV) paperwork so that they may be returned to the supplier for repair.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The MDT displays a message indicating that the APC has failed.
2. The MDT shall allow the driver to correct the system error by cycling system power OFF and then back ON.
3. The MDT shall allow the driver to send a "Failed On-Board Component" to the dispatcher.
4. The system shall provide a system log that records when the CPP EDAPTS technician is unable to do an on-route repair.
5. The system shall provide RTV paperwork to allow failed parts to be returned to the supplier for repair.

VALIDATION PLAN

1. Monitor the driver's procedures of using MDT to diagnose and report a failed on-board component.

2. Observe a CPP EDAPTS technician's activities to repair a failed on-board component

3. Create a data collection sheet (or map) that chronicles and details the driver's procedures of using MDT to diagnose and report a failed on-board component and also the CPP EDAPTS technician's procedures to repair a failed on-board component that cannot be repaired on-route.

4. Record observations about other factors and impressions. Required observations are:

    - Did the MDT indicate the failure in the APC?
    - Did the MDT allow the driver to correct the system error by cycling system power OFF and then back ON?
    - Was the driver able to send a "Failed On-Board Component" message to the dispatcher?
    - Was the technician able to record in the system log that he could not do an on-route repair?
    - Did the system provide RTV paperwork so that the vendor could repair the failed component?

NOTES

The MDT does not indicate when the APC fails.

The MDT User Manual does not provide troubleshooting guidelines.

Timestamps are recorded for the last time a device reported to the servers, and more detailed failure logs are kept on the devices as well.

The contractor does provide RMA paperwork upon request.

VALIDATION RESULTS
Did the MDT indicate the failure in the APC? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not indicate failures in the APC.
Did the MDT allow the driver to correct the system error by cycling system power OFF and then back ON? YES ☐ NO ☑ N/A ☐ Explain: The MDT does not allow system power cycling; there is no OFF button on the MDT.
Was the driver able to send a "Failed On-Board Component" message to the dispatcher? YES ☑ NO ☐ N/A ☐ Explain: There is not a "Failed-On-Board Component" message but drivers can send messages to the dispatchers via the MDT.
Was the technician able to record in the system log that he could not do an on-route repair? YES ☐ NO ☑ N/A ☐ Explain: The log records the failures automatically.
Did the system provide RTV paperwork so that the vendor could repair the failed component? YES ☑ NO ☐ N/A ☐ Explain: The contractor provides RMA (Return Merchandise Authorization) paperwork.
Was the operational scenario (3.6.6 ON-BOARD EQUIPMENT FAILS) executed successfully? YES ☐ NO ☑ N/A ☐ Explain: Although drivers can send messages to the dispatchers via the MDT, the MDT does not indicate a failure in the APC and its power cannot be cycled by the driver.
What worked? Drivers are able to send message to the dispatcher via the MDT.

RTV paperwork was provided.
What didn't work? The MDT did not indicate a failure in the APC. MDT does not allow system power cycling; there is no OFF button on the MDT.

3.6.7 TRANSIT SIGN FAILS

DATE: 3-10-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.7):

The transit sign at Stop 5 displays an "Out of Service" message indicating that it has failed. The driver on Route A1 reports the message to dispatcher via the voice radio system. The Customer Service representative has also advised the dispatcher that a few students have called reporting the sign's message.

The EDAPTS technician is dispatched to the sign with supply of spare parts and diagnostic tools. The technician finds the problem and replaces a failed power supply. The problem and its resolution are noted in system log and the failed part is brought back to the shop so that it can be returned to the vendor for repair.

After returning to the office, the technician generates the Return To Vendor (RTV) paperwork so that the power supply can be returned to the supplier for repair.

The on-site repair capability has saved at least six hours of labor by not having to remove the sign, take it to the shop and then reinstall the sign once the repairs have been completed.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The transit sign displays an "Out Of Service" message when it fails.
2. Drivers shall be able to communicate with dispatchers via a voice radio system. (Previously validated, see Section 3.3.2)
3. The system shall provide a log that will record when an EDAPTS technician replaces parts.
4. The system shall provide RTV paperwork to allow failed parts to be returned to the supplier for repair. (Previously validated, see Section 3.6.6)

VALIDATION PLAN

1. Observe a CPP EDAPTS technician's activities to repair a failed sign.
2. Create a data collection sheet (or map) that chronicles and details the CPP EDAPTS

technician's procedures to repair a failed sign and generate RTV paperwork.

3. Record observations about other factors and impressions. Required observations are:
    - Did the transit sign display an "Out Of Service" message when it failed?
    - Was the technician able to repair the sign?
    - Did the system record the sign's problem and resolution?

NOTES

The Transit Signs do not display "Out of Service" messages simply to save power. When the button is pressed the Transit Signs will announce that it is not in service and will announce a numerical diagnostic code to be relayed to the Contractor.

I went to a failed sign and it was not displaying any information. When I pressed the audio button it said that the sign was not working and gave me an error code of 120.

Timestamps are recorded for the last time a device reported to the servers, and more detailed failure logs are kept on the devices as well.

VALIDATION RESULTS
Did the transit sign display an “Out Of Service” message when it failed? YES ☐ NO ☑ N/A ☐ Explain: The sign did not display an “Out Of Service” message. However, it did announce an “Out Of Service” message that gave an error code.
Was the technician able to repair the sign? YES ☐ NO ☐ N/A ☑ Explain: Whenever the signs have had a failure we contacted the contractor and they were able to resolve the problem.
Did the system record the sign’s problem and resolution? YES ☑ NO ☐ N/A ☐ Explain: Timestamps are recorded for the last time a device reported to the servers, and more detailed failure logs are kept on the devices as well.
Was the operational scenario (3.6.7 TRANSIT SIGN FAILS) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: Although the sign did not display an “Out of Service” message it did announce one when the button was pressed. The contractor has always repaired the signs when requested. The system recorded the sign’s problems and resolutions.
What worked? The system recorded the sign’s problems and resolution.
What didn’t work? The sign did not display an “Out Of Service” message.

3.6.8 COMPUTER CONSOLE OR SERVER FAILS

DATE: 3-10-09	**TESTER(S):** Ryan Beasley

FACILITATOR(S):

OPERATIONAL SCENARIO (EDAPTS Operations Description Section 4.6.8):

A dispatcher notes a problem with his console has occurred when he sees a warning message on the Schedule Adherence GUI. A technician is requested to repair the system.

The CPP EDAPTS technician investigates problem using the troubleshooting guidelines and system diagnostic tools inside the EDAPTS User's Manual. She determines the cause of failure to be a software configuration error. The error occurred during a recent software update.

After correcting the problem and verifying that proper operation has been restored, she checks all other consoles and makes sure they are not affected. Finding no other problems, she notes the failure in the system log for possible future use in trend analysis.

OPERATIONAL CHARACTERISTICS TO BE VALIDATED

1. The system shall provide a warning message on the Schedule Adherence GUI when a problem with the dispatcher's console occurs.
2. The system shall provide a User's Manual that includes troubleshooting guidelines and various system diagnostic tools to assist in assessing problems. (Previously validated, see Section 3.6.5)
3. EDAPTS technician shall be able to diagnose software configuration errors on dispatcher consoles.
4. The system shall provide a log that will record when an EDAPTS technician replaces parts. (Previously validated, see Section 3.6.7)

VALIDATION PLAN

1. Observe a CPP EDAPTS technician's activities to repair a failed dispatcher console.
2. Create a data collection sheet (or map) that chronicles and details a technician's procedures for repairing a failed dispatcher console, logging the problem and verifying that the console has been completely repaired.

3. Record observations about other factors and impressions. Required observations are:
    - Did the warning message on the Schedule Adherence GUI appear when the dispatcher's console failed?
    - Was the EDAPTS technician able to diagnose software configuration errors on dispatcher consoles?
    - Was the technician able to repair the dispatcher's console?

NOTES

This scenario is similar to Section 3.6.4.

The dispatch console is a web interface; there is no software needed to be installed for the dispatch console to work properly.

There was an error in the dispatch console and the warning was displayed in the bottom left corner of my web browser.

If the dispatch console fails to work properly Cal Poly Pomona personnel must report the problem to the contractor.

The contractor engages proactive monitoring of all their connected services including vehicle equipment, signs and the web portal; it is unlikely that Cal Poly will notice a systemwide failure before the contractor will.

VALIDATION RESULTS
Did the warning message on the Schedule Adherence GUI appear when the dispatcher's console failed? YES ☑ NO ☐ N/A ☐ Explain: The web browser displayed the warning in the bottom left corner.
Was the EDAPTS technician able to diagnose software configuration errors on dispatcher consoles? YES ☐ NO ☐ N/A ☑ Explain: The contractor will be responsible for this.
Was the technician able to repair the dispatcher's console? YES ☐ NO ☐ N/A ☑ Explain: The contractor will be responsible for this.
Was the operational scenario (3.6.8 COMPUTER CONSOLE OR SERVER FAILS) executed successfully? YES ☑ NO ☐ N/A ☐ Explain: If a problem occurs with the dispatch console Cal Poly Pomona is only responsible for contacting the contractor.
What worked? The web browser displayed the warning in the bottom left corner.
What didn't work? N/A